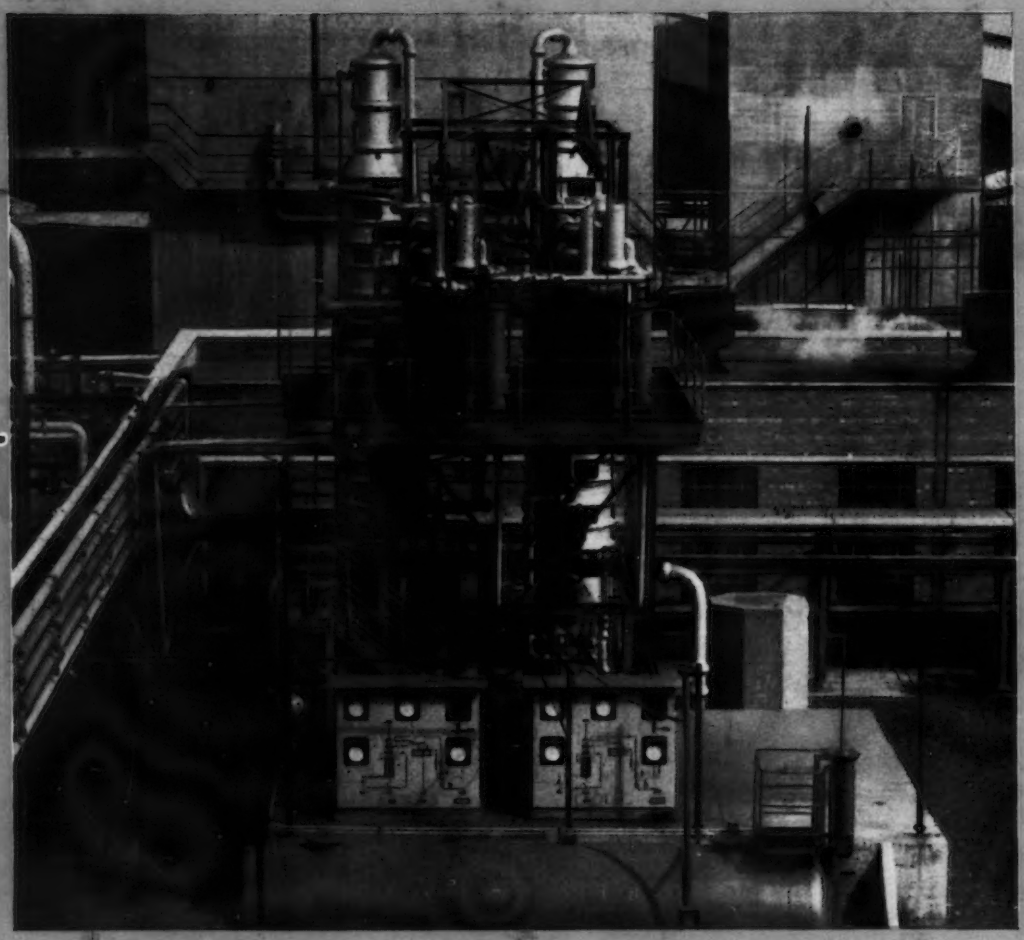
TECHNOLOGY DEPT.

Gas Journal

VOL. 289. 109th YEAR. LONDON, FEBRUARY 13, 1957. Nº 4883 PRICE 1/6

Liquor Concentration Plant



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measured breathing.....

How fascinating to watch the Rana Temporaria (frog to you!) — to see the sensitive pulsations of its pouch.

How interesting to make comparisons with that man-made breathing and measuring device — the modern gas meter. The movement of its diaphragm is equally sensitive .... but the leather itself is immensely more robust.

D. & G. L. Leathers are scientifically selected for thickness, non-porosity and strength, and are processed to give long and accurate metering anywhere in the world.

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Specialists for over a hundred years in
LEATHERS FOR THE GAS INDUSTRY

vertical reciprocating compressors FOR GAS

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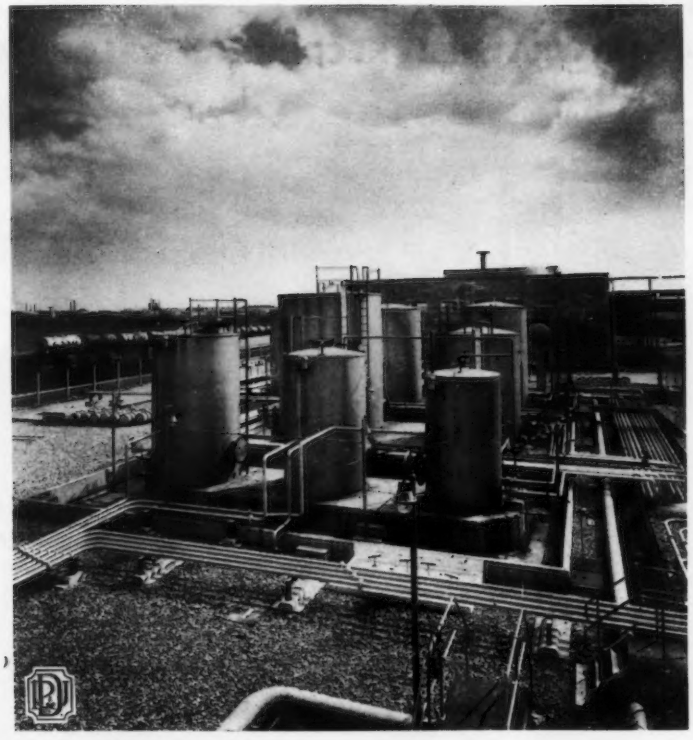
Two 10" Compressors each capable of passing 150,000 cu. ft. gas per hr. at 15 lbs. per sq. in. pressure, running at 420 r.p.m., one driven by a Gas-Oil Engine and one driven by a pressurised variable-speed Electric Motor with automatic control.

Your requirements can be met with a "DONKIN" unit of proved reliability embodying sound engineering practice and first-class workmanship.

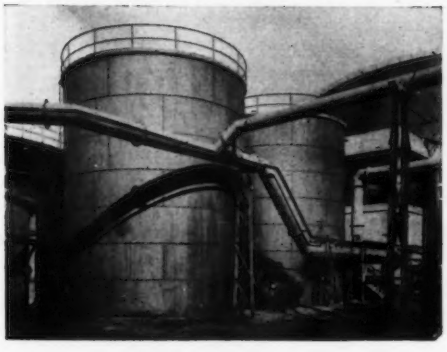
The **BRYAN DONKIN CO LTD** · Chesterfield
LONDON MANCHESTER · MEMBERS OF THE SOCIETY OF BRITISH GAS INDUSTRIES



The hallmark of high quality plant.

STEEL TANKS

by DEMPSTERS of MANCHESTER



The two illustrations are by courtesy of the Associated Ethyl Co. and the North Thames Gas Board.

We make stills and tanks of cast iron or steel ; tanks with open or closed tops ; with dished, coned, or flat ends ; of cylindrical or rectangular form ; of bolted, riveted, welded or pressed construction ; with trussed self-supporting crowns ; and for the storage of liquor, oil, spirit, tar, water, etc.

Our workshops are well equipped and our available services include facilities for heat-treatment and stress-relieving of welded products ; the thorough examination of welding by means of X-rays; and the use of isotopes for gamma-ray testing where necessary.

Your orders and enquiries will be welcomed by :—

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MAKERS OF HIGH QUALITY
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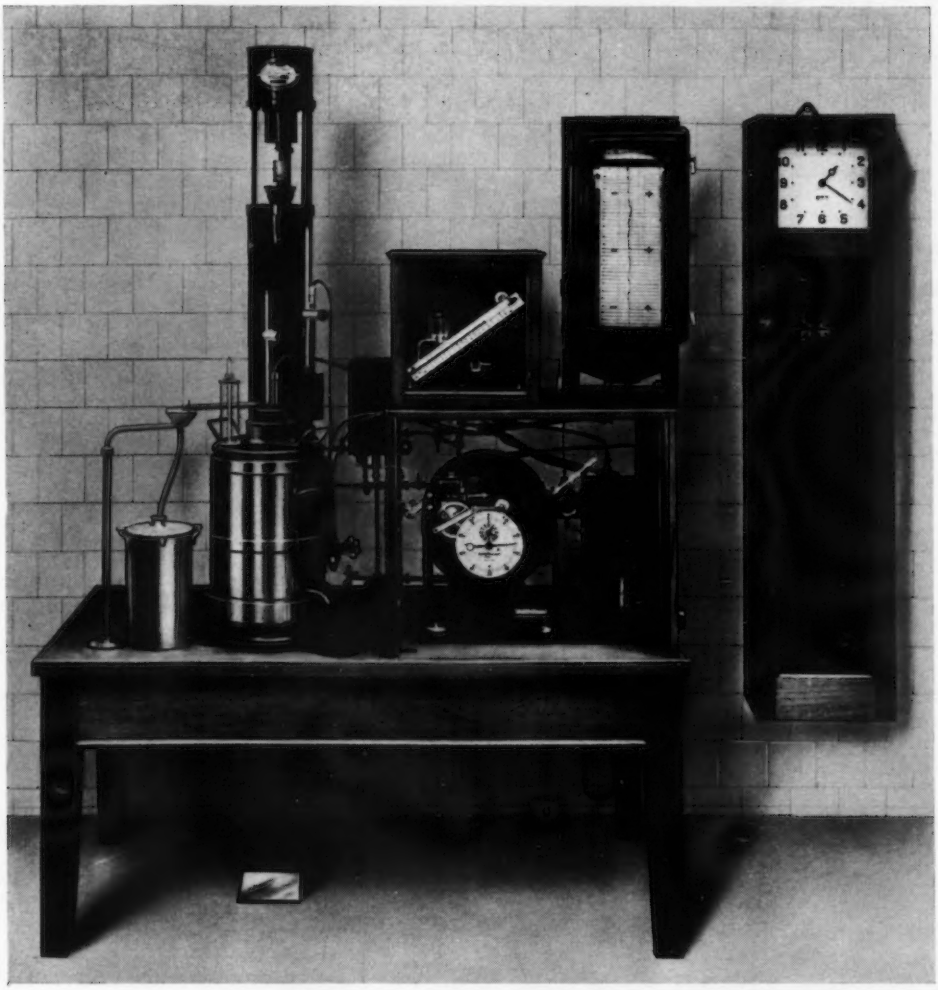
THE — NEW DESIGN

— FAIRWEATHER RECORDING CALORIMETER, MARK II



The new Fairweather Recording Calorimeter, Mark II, possesses all the accuracy and efficiency of its larger predecessor, but with many important improvements—

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- SHORT WATERHEAD COLUMN
- SUBSTANTIAL ECONOMY IN WATER USAGE
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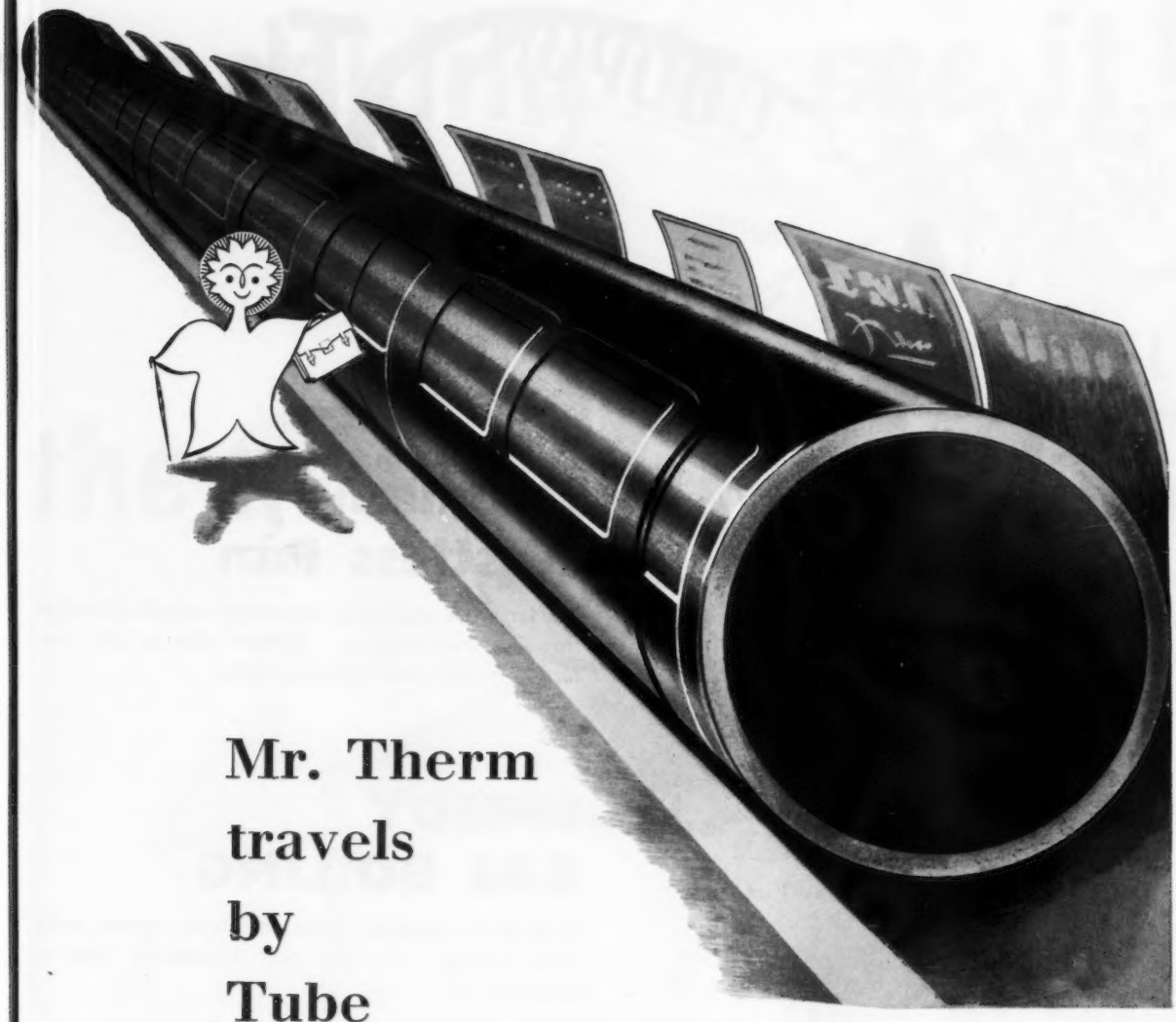

Mr. Therm travels by Tube

Gas has been sold in 'therms' since 1920. In the Thirties, the new unit of measurement was popularised by Mr. Therm, on the hoardings, in the papers.

Now, everyone knows Mr. Therm. His lambent figure stands for gas—and for progress. As part of this progress, the gas industry is increasingly using I.C.I. copper tubes and I.C.I. tube fittings, which have won wide acceptance on account of their reliability and consistent conformity to a rigorous specification—ensured by the latest methods of production and inspection.

For the home or the factory, the office or the school—right from mains to supply point—wherever there's gas, Mr. Therm and I.C.I. copper tubes are ideal partners.

I.C.I. COPPER TUBES AND FITTINGS

INCLUDING 'Kuterlon', 'Intex P.T.', 'Kuterlite', 'Instantor'

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Name: .....

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National Advertising

Dean's are inserting advertisements in the powerful National Press. Hard hitting announcements are booked for :—

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Over To You!

Enquirers who complete coupons appearing in press advertisements will be directed to apply to their nearest Gas Showrooms to see the new Dean "150". They'll be coming in wanting to see it!

11 Gallon Rustless Pan

The large size aluminium pan ensures complete freedom from rust and chipping. Cannot stain as only non-ferrous metallic parts contact clothes.

SPEEDY GAS BOILING

Designed for economy in use, the burner ensures really rapid boiling. Lighting port located in front — below tap.

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Contemporary design and clean lines appeal to housewives who take a pride in their homes. Dean's "150" is constructed to take the Hand Agitator Unit and Wringer as optional extras (available shortly).

DEAN

The home help for millions of housewives

Washday Appliances

Manufactured and distributed solely by :

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Victoria Works, Burnley, Lancs.

'll be asking to see it!

the new DEAN

MODEL "150"

£8

retail in White or Cream, £7.15.0d. in mottled finish.

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LEAD PIPE, LEAD SHEET & SOLDER

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a Subsidiary of the Birmingham Small Arms Co. Ltd., IS NOW actively engaged in further developing and expanding the activities acquired from The Birtley Co. Ltd., from which old established Company the specialist design and technical staff have transferred bringing to the new Company the benefits of many years practical experience and technical knowledge of the design and construction of Complete Coal Preparation Plants and Materials Handling Installations.

Projects at present being designed or under construction include :—

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Ollerton Colliery, Dirt Handling, 95 ton/hr.; Ollerton Colliery, Tromp Washery and Froth Flotation, 350 ton/hr.; Swadlincote Colliery, Screening and Crushing Plant, 50 ton/hr.; Askern Colliery, Tromp Washery, 240 ton/hr.; Welbeck Colliery, Bagging Plant, 75 ton/hr.; Woolley Colliery, Froth Flotation, 12 ton/hr.; Warsop Colliery, Tromp Washery, 280 ton/hr.

for The Central Electricity Authority :
Blyth "A" Power Station, Handling Plant, 1200 ton/hr.

and Sampling Equipments for Power Stations at :
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also Handling Plants for :
Appleby Frodringham Iron and Steel Co., Coke Handling, 200 ton/hr.; Woodhall Duckham, Coal and Coke, 200 ton/hr.; North Thames Gas Board, Bow Common Station, Pneumatic Cleaning Plant Extension, 15 ton/hr.

Additionally proved designs are available of primary and secondary Sampling Equipments capable of providing scientifically and automatically a truly representative sample from a wide range of materials.

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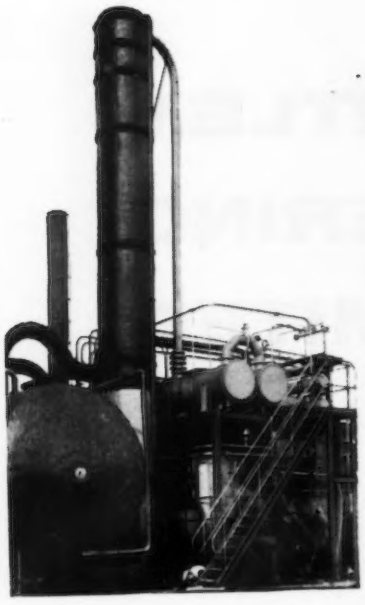

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THE HANDLING of industrial distillation problems, particularly those involving the sharp separation of very close boiling fractions, is a field which APV have made their own.

In the Carbonisation Industry, process plants developed by them operate in almost every sphere of tar by-products recovery. These vary from small " package " units for the rapid fractionation of washed or crude benzole, 90's toluole and other mixtures, to multi-column plants for the continuous isolation, from crude tar acids, of " ice crystal " or 90's phenol and cresols to any commercial specification.

The products of APV research and field experience form part of a complete chemical engineering service offered to all concerned with the recovery and refining of tar fractions.

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for the Recovery or Refining of :

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THE *Arcair* TORCH

Using only electric arc and compressed air

SAVES UP TO 80%

on gouging, grooving, cutting

The ARCAIR TORCH is a light, mobile tool that can be operated in a restricted space and in any position. It works on *all* metals and can be used for gouging defects, removing unwanted metal, cutting, grooving and shaping ferrous or non-ferrous metals. The depth of cut is easily regulated, welding or brazing can be done without further grinding or cleaning and slag from welding does not interfere with cutting action. The electrodes are quickly adjustable to any angle. No gas cylinders or regulators are necessary. *Outstanding for speed and economy, the* ARCAIR TORCH *has wide applications in the Gas Industry, mines, quarries and foundries.*

Padding of clutch casting removed with Arcair Torch. Note clean surface. Vertical and horizontal cuts in one operation.

- *Works on all metals*
- *Many times faster than chipping*
- *Low initial cost—low operating cost*
- *Operates on ordinary D.C. welding machine*
- *Cuts clean—no further preparation necessary for welding*
- *Easy to operate—no special skill required*

Cutting alloy casting with Arcair Torch. Tool functions in all positions. Self-aligning jets rotate with electrode to any angle.

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gas measurement

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Experience, technical resource and modern production techniques within
the Smith Meters organisation have evolved meters to meet this demand.
This illustration shows the Smith's Gas Fire Meter by

SMITH METERS LIMITED
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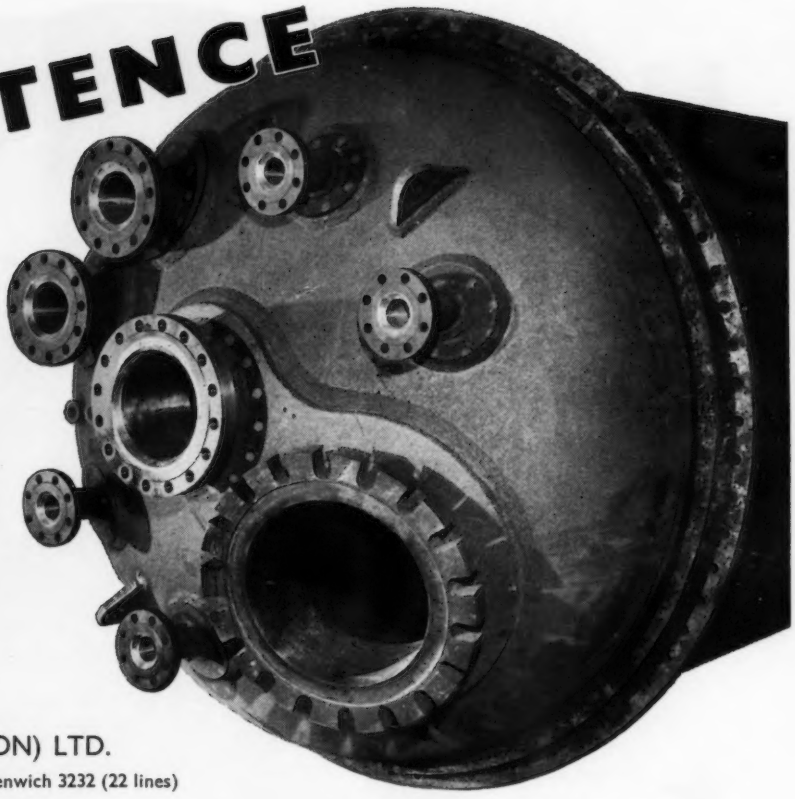

Head of a 6 ft. dia. Autoclave, spun on the Harvey "Rotarpress" from a stainless steel disc 1⅛ in. thick. Designed for a working pressure of 500 lbs./sq. in.

AN EXAMPLE OF

Harvey

FABRICATION

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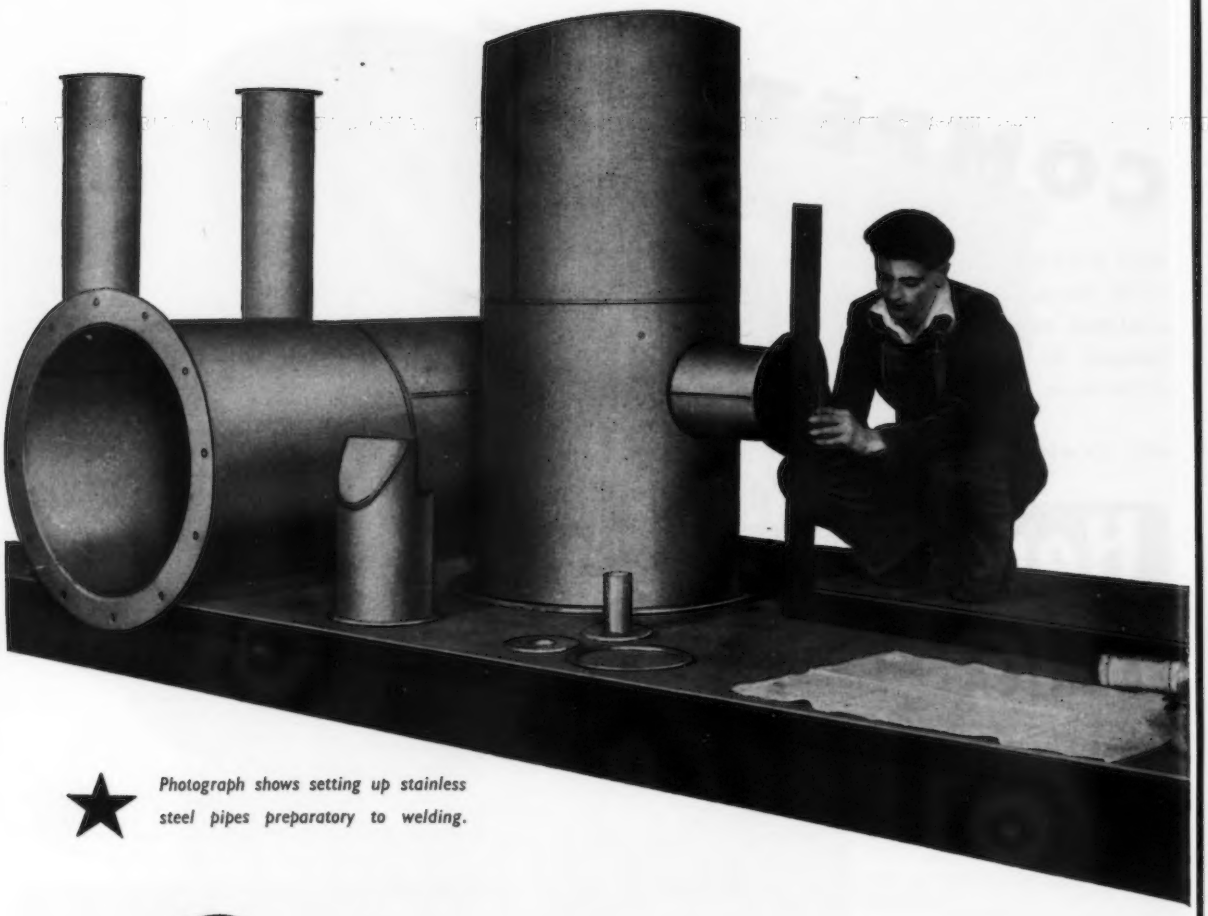
Spun Iron Pipes & Flexible Joints

ALL COCHRANES SPUN IRON PIPES ARE WORKS HYDRAULICALLY PROOF TESTED TO 500 LB. PER SQUARE INCH

Screwed-Gland Flexible Joint : up to 10" dia.
Bolted-Gland Flexible Joint : 7" and above

Cochranes (Middlesbro) Foundry Limited, Middlesbrough



★ *Photograph shows setting up stainless steel pipes preparatory to welding.*

Fabrication in STAINLESS STEEL

Widnes Constructional Department is manned by a staff of highly skilled designers and erectors, and is equipped for the production of Tanks for storage or mounting on road vehicles, High and Low Pressure Vessels, Adsorbers, Vertical Air Heater Shells, Crystallizers, Stills, Viscose Kettles, etc., in Stainless steel.

ESTABLISHED 1841

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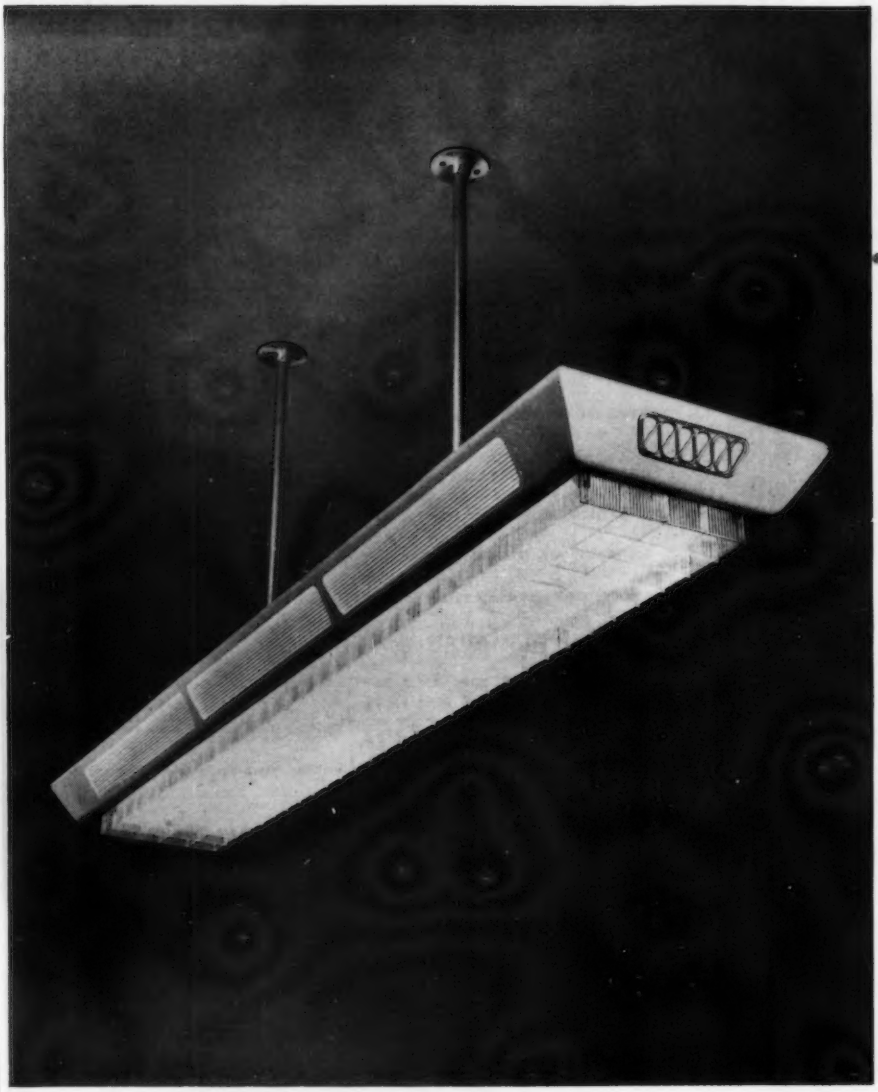


Fitting illustrated F 41030/1

You'll be glad it's . . .

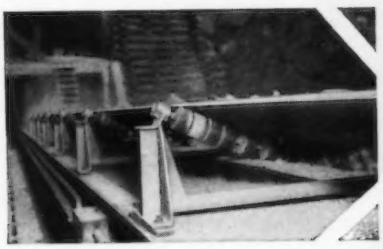
- *Each fitting is the result of the closest collaboration between expert designers and lighting engineers.*
- *Each fitting is made to rigid factory standards for long arduous service.*
- *Operating efficiency is guaranteed because the control gear and tubes are made within the G.E.C. organisation.*
- *Consult your contractor for the most suitable G.E.C. fittings . . . with OSRAM tubes of course.*

G.E.C.

● *The General Electric Co. Ltd, Magnet House, Kingsway, London WC2*

"I MUST ADMIT I WAS SURPRISED BY THIS REPORT"

"Belt wear and the cost of replacing conveyor idlers has always been one of our biggest handling problems, and, naturally, I've always been on the lookout for any new method of increasing the life of both. Coke is one of the most difficult materials to handle, and our normal idlers just weren't standing up to the wear and tear. With this sort of problem I was only too willing to let young Johnson have his head with this new Limberoller idler. When he wanted to let the Joy-Sullivan people install ten of these idlers at one of our trouble spots on the conveyor lines I readily, though in truth a little sceptically, gave the 'O.K.' It was only when he presented his report to me a few days ago that I realised the Limberoller idlers had been working for six months. Obviously, he got a big kick out of that report — and I don't wonder. Just look at this:—"



TYPE OF IDLERS : Limberollers. Designed by Joy in America. Built in Britain by Joy-Sullivan Ltd.

BASIC DESIGN DETAILS : Revolutionary design. Flexible steel cable covered in Neoprene and with Neoprene discs. Uses only two sealed-for-life bearings. (And they really are sealed-for-life).

NUMBER OF IDLERS INSTALLED : Ten.

PLACE OF INSTALLATION : South Bank—a constant trouble-spot.

DATE OF INSTALLATION : 5:3:56

DATE OF INSPECTION AND REPORT : 5:8:56

RATE OF WEAR : No wear as yet. Mould flashings still clearly visible on discs.

CARRYING QUALITIES : Excellent. Limberoller idlers shape themselves to the load carried. Spillage reduced.

INSTALLATION DIFFICULTIES : None at all. They are far lighter and more easily installed, knocked down and moved.

MAINTENANCE PROBLEMS : Again, none at all.

SPACING ON BELT : Very economical. Each idler supports more belt than any conventional type. We are using 5' spacing.

RELATIVE WEIGHT : Complete Limberollers weigh as little as one-third of the weight of our existing idler sets.

RELATIVE COST : Very competitive. Neoprene is a must for the really tough jobs, but with less idlers per belt cost is kept down. Rubber Limberollers would be ideal for easier conditions such as the Victoria Works, and naturally cost less.

R.W. Johnson

R. W. Johnson.

"Well, there you have it, gentlemen. For about fifty pounds we have tested these Limberollers and the potential savings revealed more than justify the experiment. Just think what we could do if we standardised our entire conveying system with Limberollers."

Just think what you *could do. Why not contact Joy-Sullivan now and try the ten Limberoller test yourself.*

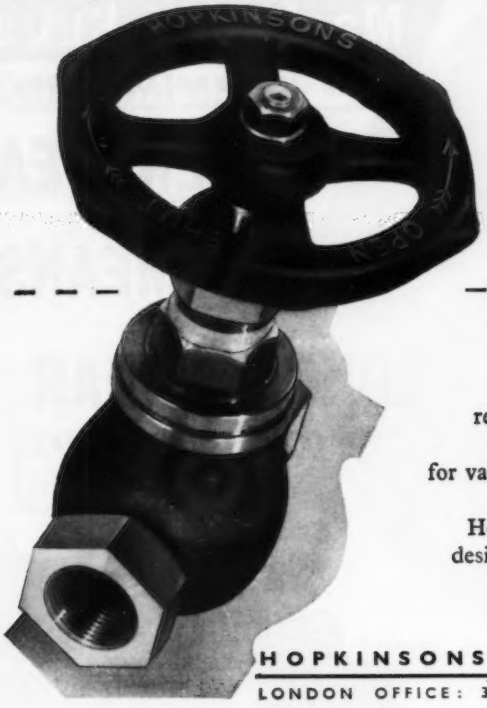
JOY · SULLIVAN LTD

Please write to Joy-Sullivan Ltd., Cappielow, Greenock, Scotland, or 6 Carlos Place, London W.1. for leaflet L115 which will give you the Limberoller's full story, and details of its many applications.

after you've remembered HOPKINSONS

you can forget your

SMALL BRONZE VALVES



Here is a range of valves, any one of which can be relied upon to serve for years of trouble-free operation. They embody, for instance, our 'Platnam' alloy for valves and seats, and incorporate the same principles of design and excellence of materials as the larger Hopkinsons' Valves. Available up to 2" bore in many designs; write for Catalogue No. 951 - 'Bronze Valves'

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GAS METERS

Small case domestic — D1, D1.200, D2, D4.

First-class workmanship and first-class materials ensure maximum working life. All S.H.C. Meters are to I.G.E. Specifications. Direct-reading indices available if required.

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WARWICK ROAD · GREET · BIRMINGHAM, 11

and at LONDON and NOTTINGHAM

Looking for *cheaper* steam?

With the cost of fuel continually going up, how on earth is one to stabilise, let alone reduce, the cost of raising steam?

The most practical answer is to increase the efficiency of the boiler itself, by taking some of the valuable waste heat from the flue gases to pre-heat the feed water, thereby using some 10-20% less fuel for a given amount of steam. In other words, by installing a Senior Economiser. Senior Economisers, with their patented H-gilled heat exchange tubes, combine maximum effective heating surface with minimum resistance to flue gas flow. Straight, uniform gas passages, which do not collect soot, keep draught losses consistently low and rate of heat recovery constant.

The advantages of Senior Economisers apply to any type of boiler burning more than 20 tons weekly of any type of fuel. We build them individually to suit your plant. Capital cost is soon repaid in fuel savings.

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Senior H TUBE economisers *for cheaper steam*

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MacLellan Rubber

CARRIES INDUSTRY FORWARD

EVEN WEAR MEANS LONGER WEAR

IN CONVEYOR BELTING

If every foot of a Conveyor Belt is as tough as the next, wear will be more uniform over the whole length. Continual replacement of unserviceable parts will be cut to a minimum, and uneven tension and stress will be reduced.

The advantages are threefold,—better performance, lower maintenance charges and less replacement cost.

By continuous vulcanising, experienced compounding and controlled processing MacLellan produce Conveyor Belting that is tough all through. There are various qualities and grades, and one of them is right for your work.

Please Ask.

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MARYHILL, GLASGOW. N.W.

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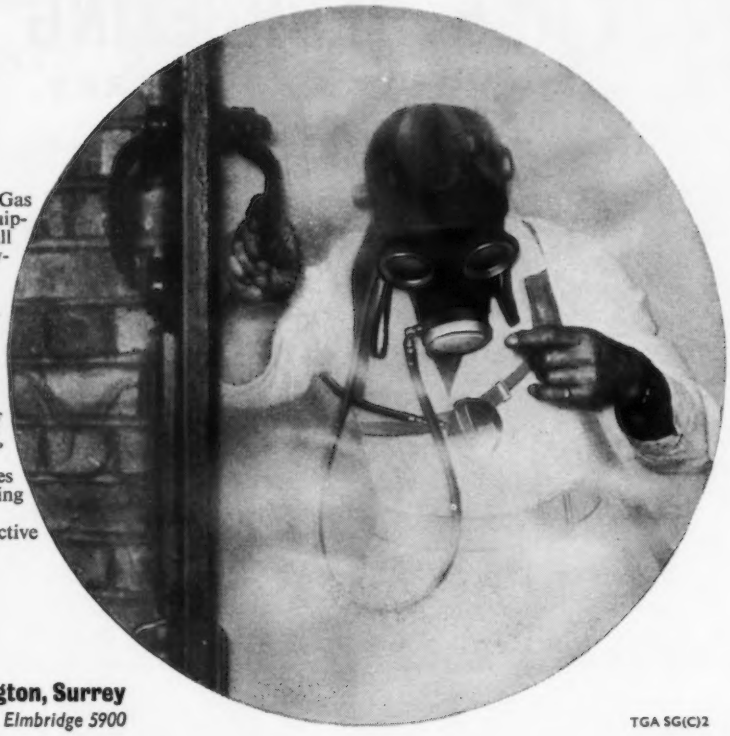
SAFER with...
Siebe Gorman



IN GASEOUS ATMOSPHERES, in Chemical, Gas and Refrigerating Plant, Siebe, Gorman equipment safeguards life and health. It covers all routine and emergency requirements, involving repairs, inspection and rescue.
Here are some typical applications:
SELF-CONTAINED BREATHING APPARATUS. Compressed air and oxygen types with durations from ½ hour to 2 hours.
RESPIRATORS of the filter type. "Puretha" Mark IV and "Gaspro" Gas Respirators. Also dust and fume masks.
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Established 1819

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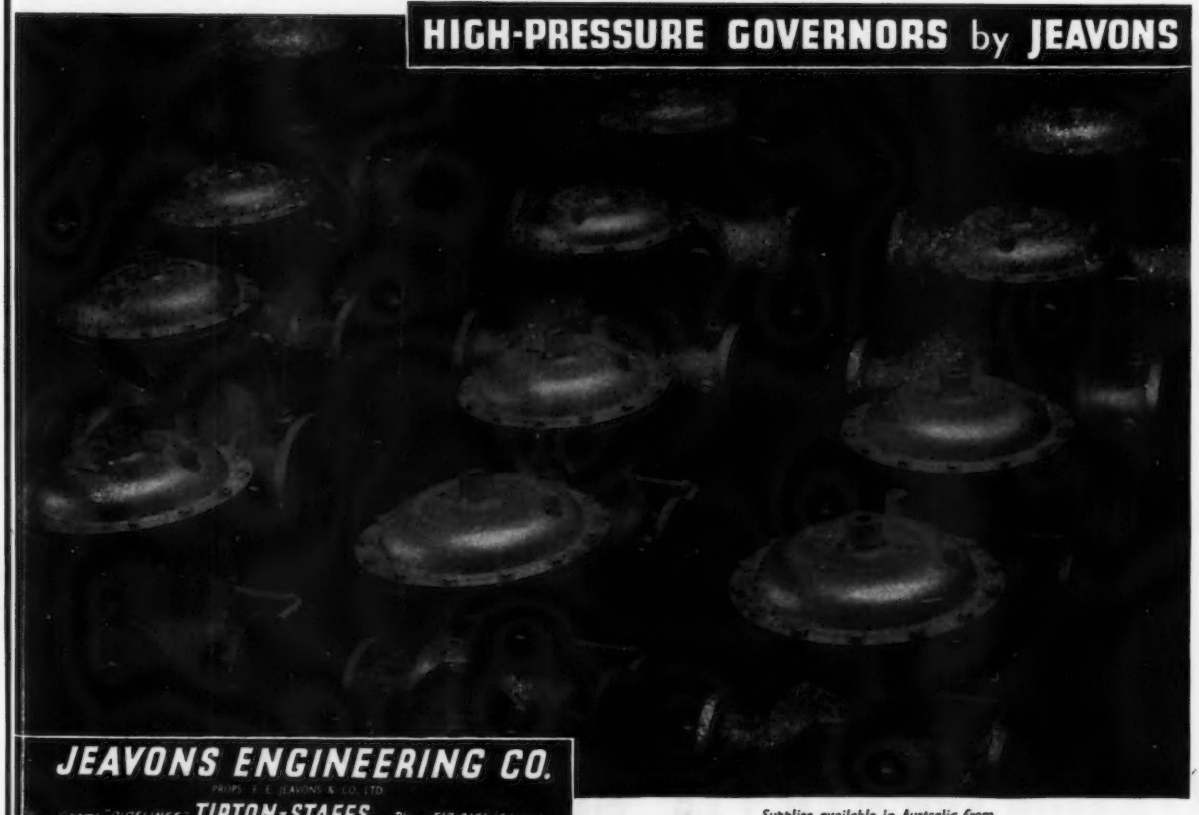
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JEAVONS ENGINEERING CO.
PROPS: F. E. JEAVONS & CO. LTD.
GAS PIPELINES TIPTON-STAFFS Phone TIP 2161 (6 Lines)

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COKE DEBREEZING EQUIPMENT

—AT MOND GAS WORKS, TIPTON, STAFFS

★ The West Midlands Gas Board use a C. & T. 60ft. centre Super Mobile Stacker delivering coke on to a C. & T. Skid mounted Debreezing Unit. Stacker is fitted with oversize hopper and fed direct from mobile shovel.

Coke is delivered into the screen hopper then fed on to a mechanically vibrated single deck screen. Oversize material is discharged via either of twin discharge shoots, into railway waggons.

'Fines' pass through the mesh and are collected in storage hopper where it accumulates, prior to discharge into road vehicles.

CAPACITY

30/40

TONS PER HOUR

FULL PARTICULARS ON APPLICATION TO:—

CRONE & TAYLOR (Engineering) LTD.

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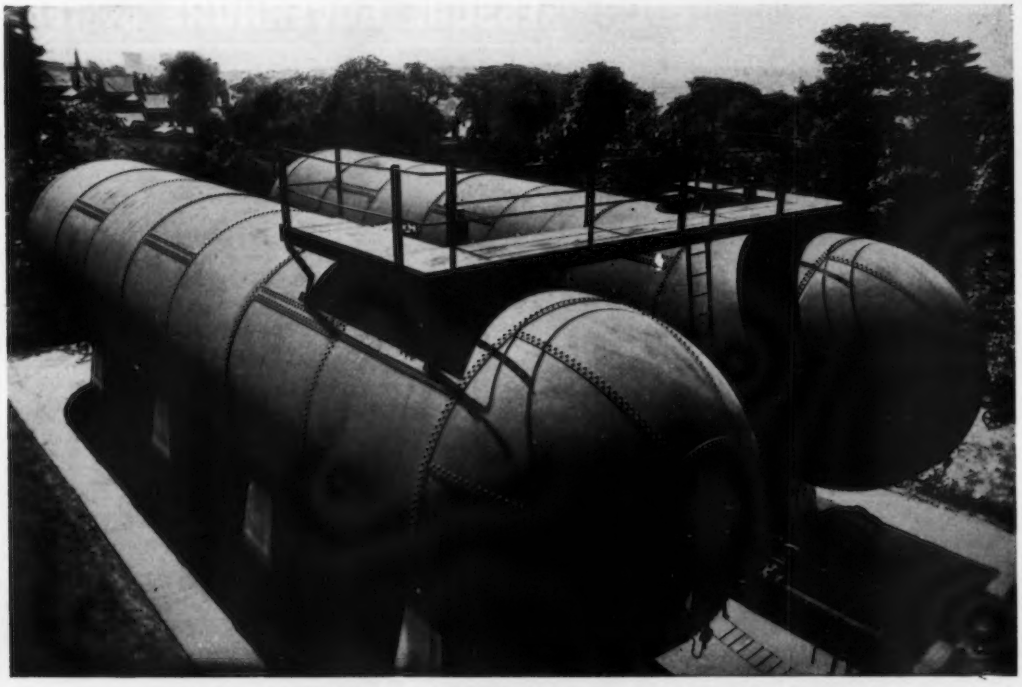

HIGH PRESSURE GASHOLDER INSTALLATION

RIVETED HIGH PRESSURE GASHOLDERS. 60 lb. per sq. in. working pressure

CLAYTON SON & CO. LTD., MOOR END, HUNSLET, LEEDS

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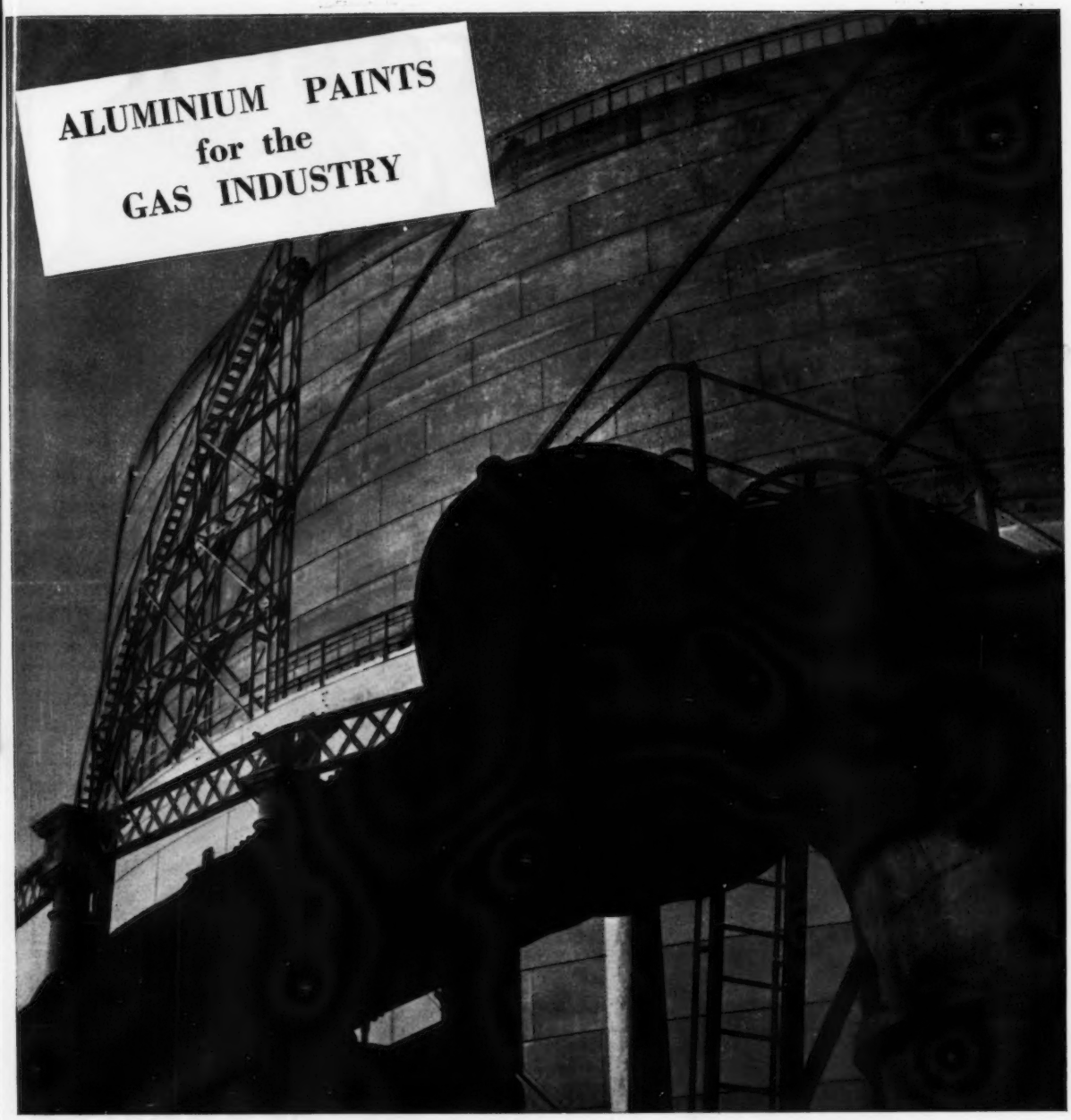

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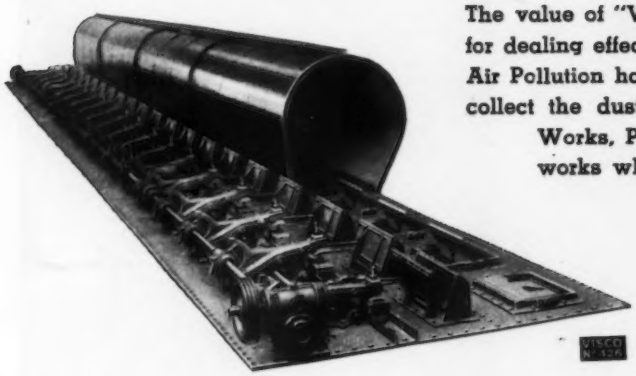

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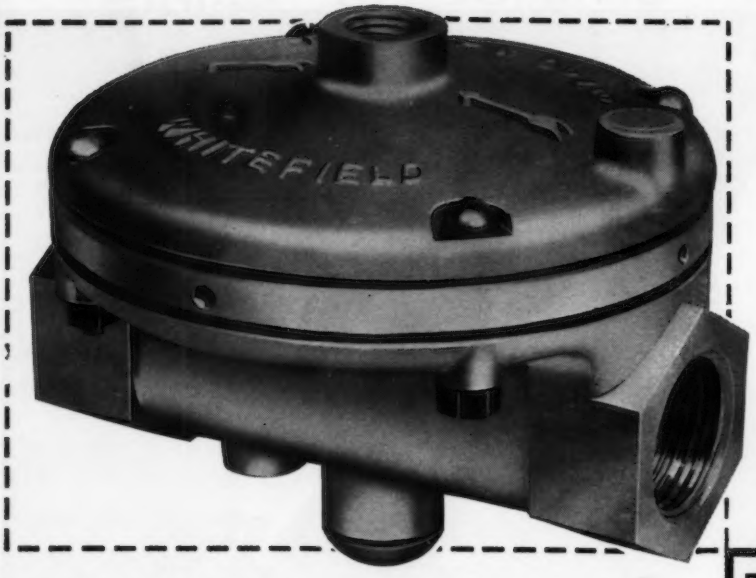

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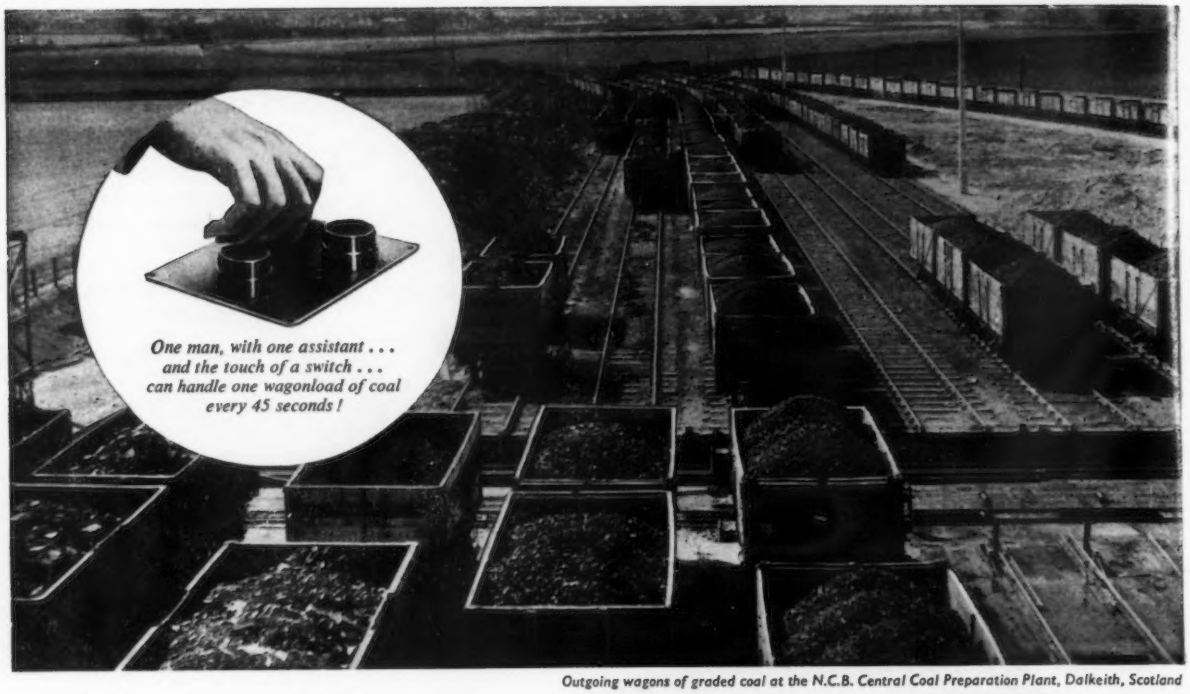

Outgoing wagons of graded coal at the N.C.B. Central Coal Preparation Plant, Dalkeith, Scotland

NEW APPROACH TO WAGON HANDLING

. . . Mitchell system means smaller sidings, quicker turnround, less gear, greater safety

How many men work on your coal sidings? How many locomotives or capstans? What space is wasted by sprawling tracks? How much tonnage can you handle per hour?

The generally unsatisfactory answers given to such questions as these inspired the design of the Mitchell system of wagon handling—a mechanical, electrically-controlled system that offers remarkable scope for increased efficiency at power stations, collieries, coal preparation plants, steelworks, etc., and other centres of industry possessing marshalling yards.

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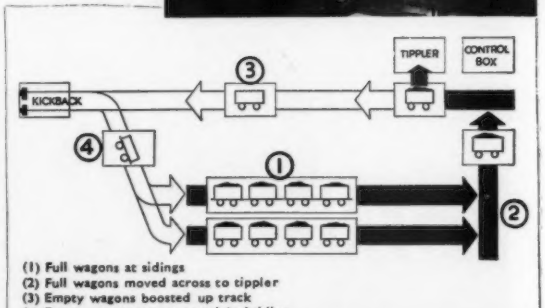
By demanding no more than half the space occupied by traditional balloon sidings, the Mitchell system makes possible the erection of new plant on sites hitherto unsuitable, with very large savings in initial and later costs. Its flexibility makes it adaptable to any individual handling problem. Installations are already at work for the National Coal Board and the British Electricity Authority. The thoroughgoing efficiency and economy of the Mitchell system puts it far in advance of any traditional method and establishes it as the system of the future.



(1) Full wagons at sidings
(2) Full wagons moved across to tippler
(3) Empty wagons boosted up track
(4) Empty wagon returns to original siding

An installation at the British Electricity Authority Freemens Meadows, Leicester, handling 800 tons of coal an hour. The site is limited in area and normal methods of working with balloon sidings would be impractical. The pictures show the traverser pulling an incoming truck on to the transfer rail and an emptied wagon being returned to the siding by the 'kickback'.

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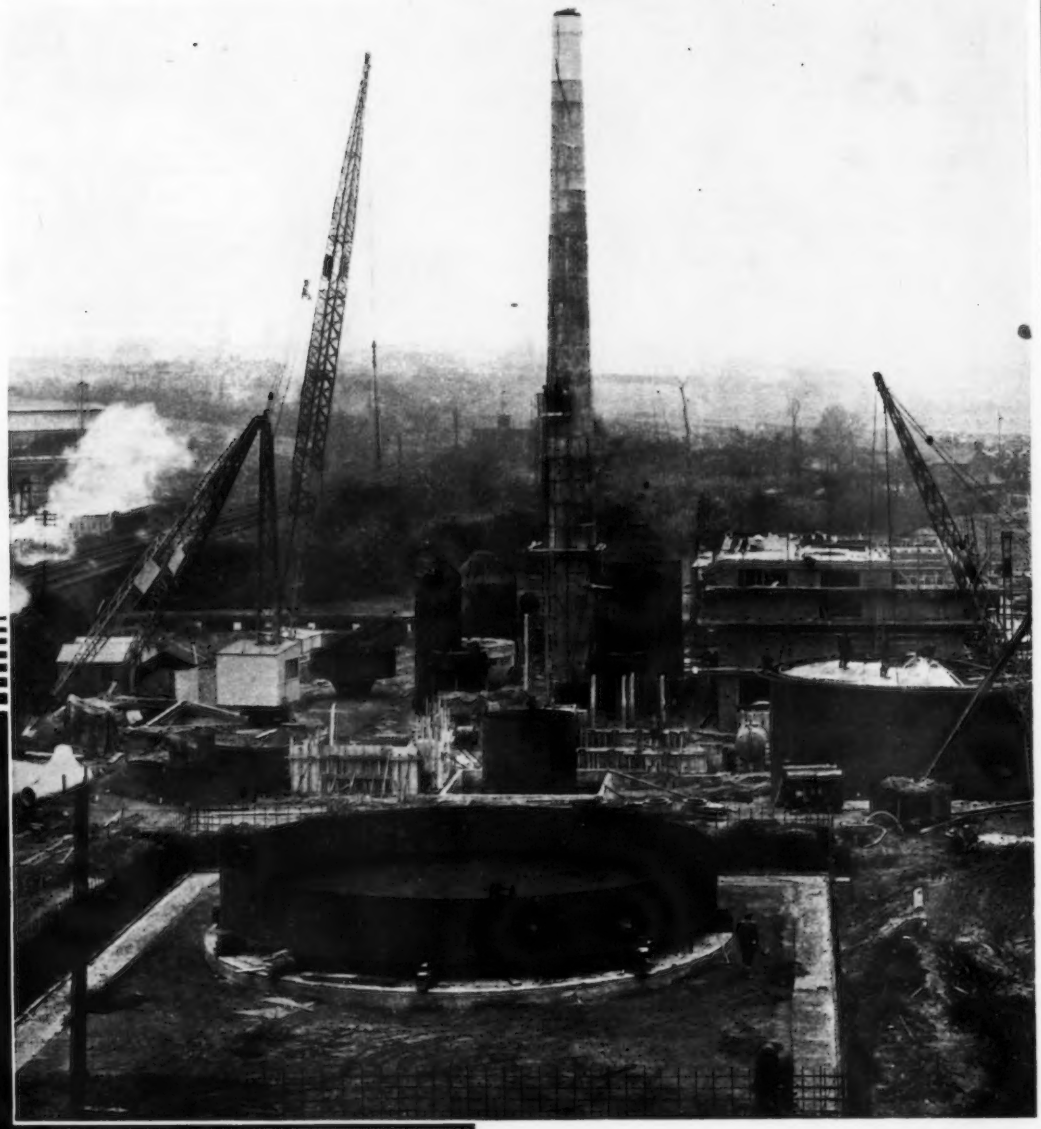

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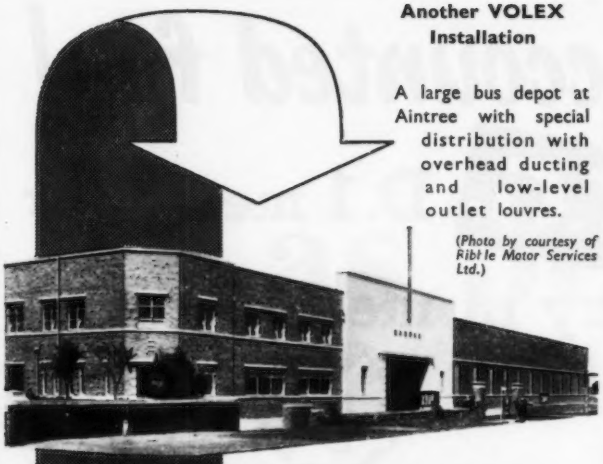

Another VOLEX Installation

A large bus depot at Aintree with special distribution with overhead ducting and low-level outlet louvres.

(Photo by courtesy of Ribble Motor Services Ltd.)

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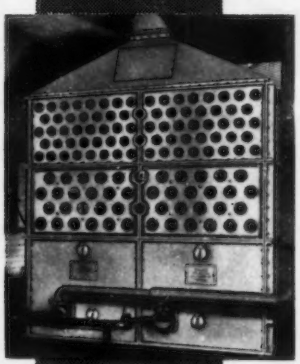

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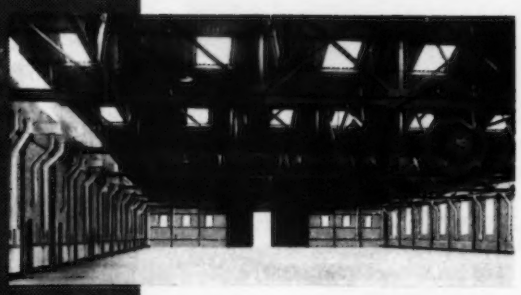

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Gas Journal

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109TH YEAR

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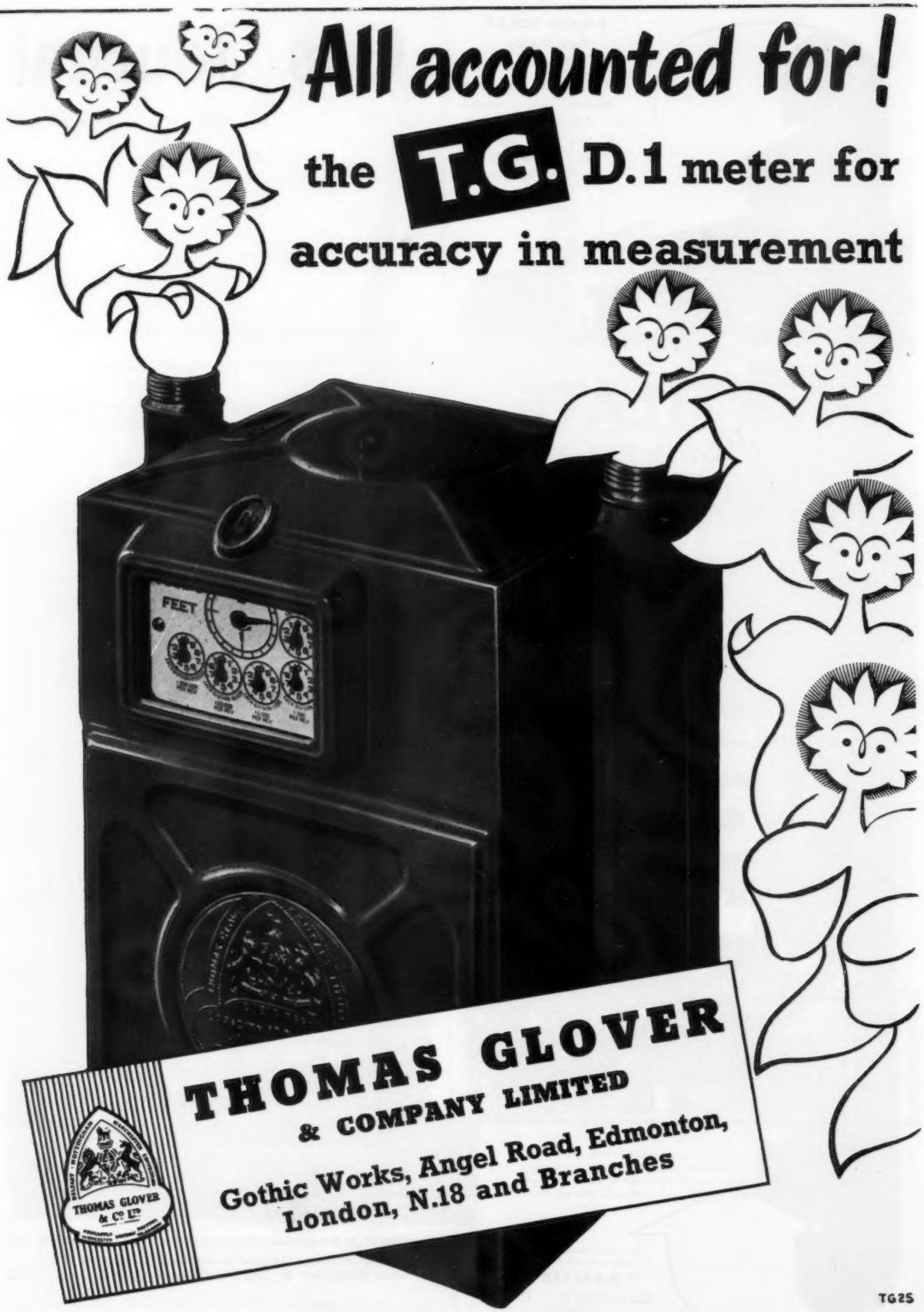

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Gas Journal

VOLUME 289. No. 4883. FEBRUARY 13, 1957. 109th YEAR

Fuel and Power in Switzerland

A VISITOR to Switzerland might be forgiven if he formed the impression that a very large proportion of her requirements in fuel and power was met by magnificent development of water-power. It was therefore something of a shock to read in a recent article circulated in Switzerland that no more than 22% of her requirements in crude energy were satisfied from this source in 1954; 9% were met by the timber of her forests, but 70% were met by imports, either in the form of solid and liquid fuels or, to a small extent, electric current. It is not anticipated that home sources of power (water-power and wood), even when these are developed to the full, will substantially alter these proportions.

The utilisation of nuclear energy has awakened hopes which, however, are not expected to be fulfilled for a very long time. M. A. Winger has pointed out that the capital cost of a nuclear reactor is so high that a small country could not afford such luxuries nor accept the technical risks involved. 'In other words, we are compelled to wait, for economic reasons, until the results of experience with reactors under construction or projects in other countries are known, results which alone will permit us to determine which is the solution most favourable to Switzerland.' At the same time, if the current annual increase of 3—5% in electricity is maintained Switzerland will be driven, in the next 10 to 15 years to have recourse to nuclear energy when all her resources in hydraulic power are developed, since it is difficult to conceive that her energy deficit can be covered by coal and liquid fuels. Conditions in the mines as well as the political instability of some of the countries which are big suppliers of petroleum are, in any case, factors which must be borne in mind.

Over the 40 years, 1910-1950, the proportions of requirements in crude energy met by the several forms of supply had changed considerably. Coal had dropped 72.7 to 42%, wood and peat from 16.7 to 11.5%; liquid fuel had increased from 0.7 to 20.5% while of derived fuels, gas had dropped slightly from 5.9 to 4.8%, and electricity had increased from 4.0 to 21.2%. During this period it is noted that losses in the transformation of crude to useful energy were reduced from 60 to 42%. This improvement is attributed to improvements in appliances for the use of fuel as well as to progress in technique generally, electrification of railways, and improvements in manufacturing techniques. 'Let it be noted in passing that gas is the form of energy produced with the greatest efficiency.'

After surveying the fuel situation in Europe generally, following recent reports published by O.E.E.C., the author points out that Switzerland will always be compelled to import energy. That does not disquiet him since such imports are a necessary consequence of his country's commercial position. 'But it is in the national interest that directives for a rational utilisation of the raw materials serving for energy production should be followed.' Imported gas coals, for example, must be directed to the gasworks. 'Only an intelligent and effective co-ordination will be able to secure to our country a distribution of energy supplies in conformity with our needs.' Swiss producers of gas and electricity must agree on the employment of the two forms of energy in the home and partially in industry. 'The population must be impartially informed on this subject, for it seems that it is not generally understood that the satisfaction of our future energy requirements is a vital question.' Is it not possible to reach agreement on these points, particularly in the domain of the production of heat?

It is particularly important in Switzerland that the use of electricity in cooking should not be allowed to increase as it has done in recent years, for the obvious reasons of the inability of the power stations to cope with the consequent daily peaks of demand, peaks which the gasworks surmount with comparative ease. An examination of the position in one or two large towns resulted in the conclusion that the proportion of electric kitchens should be limited to an optimum of 40%. 'Cooking remains the key-stone of the gasworks; on the other hand not only is it not a necessity to the electricity power station but in the long run it may be

a cause of loss of profits if it is developed too much—especially as electricity can supply (both in absolute value and proportionally) energy to much greater advantage in other directions than for the production of heat.'

To guarantee to consumers 'an effective co-existence of the two forms of energy it is necessary to devise an adequate tarification.' Tariffs should not make any difference between consumers using electricity in the kitchen and those using gas. Tariffs for electricity supply as for those of gas should be revised at short intervals in line with the cost of production. Today, tariffs are unfortunately influenced by political considerations; they should be fixed solely by costs. Any other basis is in the long run inimical to the interests of the Commune and those of enterprise and consumers. Communal authorities considering their policy in this field should give weight to the following considerations: The Swiss gas industry, independently of its economic importance as supplier of raw materials, remains and will remain an essential factor in the provision of energy in town life; its great possibilities in storage at low cost makes gas the typical form of energy for cooking; modernisation of production plant, of distribution, and of appliances guarantees to consumers a sufficient and regular supply. It might be objected that coal production, the traditional raw material of the gasworks, is diminishing both in absolute and in relative values, all tending to increase the cost of gas. But it must be remembered that the financial equilibrium of the gasworks does not depend in the first place on the cost of coal but on the ratio between the cost of coal and the price of coke. On the other hand, experience both abroad and in Switzerland suggests that liquid fuels, ranging from heavy oils to the light benzenes, have recently given good results in gas production. The choice of raw materials as well as prospects in the utilisation of natural gas has thus been widened.

Four principles are emphasised in the résumé of this interesting article. There should be no monopoly in the hands of a single source of energy; co-ordination between gas and electricity in the production of heat; suppression of discriminatory tariffs and conditions of installation; intensified employment of gas in the households of all regions served by gas.

The author concludes: 'The problems we have been considering have their communal, national and international aspects. If in the years to come we do not modify our attitude, if we sacrifice our obligations to the community to short-sighted and egoist considerations, we shall pay dearly in the long run.'

Gas on North Merseyside

THE Liverpool Group of the North Western Gas Board have lately published a history of *The Development of Gas on North Merseyside*, which at this present time constitutes the administrative area of the Liverpool Group. The author is Mr. S. A. Harris, who is the former Chief Cashier of the Liverpool Gas Company who retired last September after 49 years' service with the undertaking. Mr. Harris is a well known local historian who has written a number of books on local architecture in Liverpool and is extremely knowledgeable on local history. He is, in fact, vice-president of the Historic Society of Lancashire and Cheshire, the body which has published his books.

The founder of the Liverpool Gas Light Company as it was first called, was a Mr. Hargreaves, who had been one of the Provisional Committee for the founding of the National Light and Heat Company in 1807 under Winser in London, which was later to become the Gas Light and Coke Company by Royal Charter in 1812. Hargreaves was this Company's first Deputy Governor. In 1813, he became thoroughly critical of the Company's policy and resigned. In 1815 he arrived in Liverpool and set about gaining support for a gas company. Chief among the local pioneers was Jonathan Varty, a coach builder in Dale Street, and it was in the cellars of his shop that the first gasmaking plant was constructed. By December, 1815, mains had been laid and manufacture started. By January, 1816, two large gas lamps had been lit in front of the Town Hall.

Such was the beginning of a most enterprising undertaking. Mr. Harris has relied to a great extent on the local Press for an account of the very early years, and quotes from the *Liverpool Mercury* which seems to echo the feelings in the town at that time. Later of course the Company's minute books, and letter books, supply most of Mr. Harris' information, and fortunately for posterity the great majority of these books are still intact. The Company was incorporated under its first Act of Parliament, the Liverpool Gas Act, in 1818. This Act made clear the Company's area of supply and empowered the Company to increase its capital to £50,000, which had to be raised within three years of the passing of the Act. The gas industry soon began to expand, but it was not allowed to do so without considerable competition.

The Liverpool Oil Gas Company was founded in 1823, its Act of Parliament receiving the Royal Assent on May 23 of that year, five years after the Coal Gas Company's Act became law. The Oil Gas Company was to make gas from whale oil, but from the beginning could never compete in the price of gas. In spite of raw materials becoming unobtainable in the early 1830's, it managed to keep going until 1848 after its Act had been altered to allow the manufacture of coal gas.

It had begun to lose ground to the Coal Gas Company, but Liverpool was expanding so quickly that the demand for gas never seemed to be satisfied, and there was plenty of room for both companies for a time. In the 1840's, however, competition became so fierce that the local Council tried to bring the two companies together. This they succeeded in doing and in 1848, they amalgamated to form the Liverpool United Gas Light Company. It is most interesting to think that neither company absorbed the other, but the formation of the United Company was a voluntary amalgamation with a board contributed by both companies and its senior officials taken from each company.

With the end of competition, expansion was possible with a real lowering of gas prices. No longer was it necessary to lay two sets of gas mains to encourage a consumer to leave your competitor, no longer would it be necessary to have your inspector visiting premises to 'jump the lights' to be quite certain that the right gas company's mains were connected to a consumer who might be paying his bills to the other company. During

the years that followed, the Gas Company was constantly having to put up with complaints from the local council which demanded a greater control in the management of the company and made outrageous accusations about the gas quality and what it considered the unnecessarily high price of gas; but it did nothing about buying up the Company. Its chief firebrands merely gained some cheap notoriety, as gas company baiting has always been a popular pastime.

Among the famous engineers produced by the Liverpool Gas Light Companies were Alfred King and his son. King had joined the old Coal Gas Company in its very early years in 1822 and remained its chief engineer until he retired in 1863 to be succeeded by his son, who served the company until 1902.

Mr. Harris's description of the Liverpool Gas Company, as it became in 1914, during the last 60 or 70 years is perhaps as interesting as any period. It was the first gas company to make carburetted water gas in Great Britain (the first plant in the British Isles was at Belfast), and it beat the South Metropolitan Company by a short head in adopting prepayment meters. In spite of the cautious attitude of its board the company was generally to the forefront, and visitors' books going back to the 1860's confirm this. During the world wars this company like many others had its testing time, and the rise in prices and the shortages of raw materials and manpower in the first was to be repeated in the second, with the destruction of plant as an added trial. But it rode out the gale. Perhaps this was not a little due to the appointment of its late General Manager and Secretary, Mr. C. H. Leach, who completely revolutionised the accounting system and the office administration, started a centralised gas distribution system and construction and maintenance workshops, and introduced many other innovations without which the company would never have been able to hold its eminence among its peers.

Although the greater part of the book is devoted to the history of the Liverpool Gas Company, Mr. Harris describes with almost as much detail the histories of the other members of this group, those of Southport, Prescot, Ormskirk, and Skelmersdale. Apart from those immediately connected with gasmaking in Liverpool, we think many readers will probably be interested in reading this book; we understand the Liverpool Group still has a few copies available at 12s. 6d.

Hazel Rock

PUBLIC Relations is rather a terrifying machine. There is no telling what insignificant happening will set in motion a complicated and irrelevant operation which, if unchecked, may get seriously out of hand. We wonder what notion encouraged a P.R. man to produce the strange handout which reached us last week. We read: 'There were no squares at the Hungaria last Friday when Hurseal Ltd. held their staff party. Everyone was in the groove and among the cool cats was A. C. Hazel, the managing director, who was real hep.' There followed the information that Mr. Hazel and partner were 'real hep to the rock 'n roll' and we were exhorted to 'Dig that Hazel.' Refraining an impulse to reach for a shovel, we had a look at the accompanying picture which, sure enough, showed the gentleman in question pirouetting madly in a froth of whirling skirts. It looked great fun (in a way), but we are still a bit puzzled about the underlying motive. After all, if we may put it this way, the fact that we must glim this chick and her sharp carry run cutting with a mess of honkies, and collar the righteous spiel, makes like this P.R. buddy ghee has blown his top on a psycho kick. If you dig us. . . .

Never Mix Irish With Your Scotch

OF all places for Burns Night to be celebrated Northern Ireland seems the most remarkable, yet it happens, and this year Mr. T. R. Cameron, Engineer and Manager of the Coleraine Gas Department, proposed the Immortal Memory at the Scottish Society's Burns Supper held at Portrush. We cannot imagine what Mr. Cameron said at this undoubtedly blood-stirring, pipe-skirling, haggis-ridden celebration, but he must have remembered that William Murdoch was a contemporary of Rabbie's and was born only a few miles away from him. But it is unlikely that even the historic insight inspired by a reverence and what one might term the 'spirit' of Burns could produce a record of an acquaintance between the two great men. Had they known each other and perhaps indulged in some canny transactions—such as Rabbie trying to sell William the patent for a waterless iambic pentameter—the breach between the arts and the sciences might have been less than it is today. And although we know that Burns' teacher was a certain John Murdoch unfortunately for the speculative historian there is not a shred of evidence to suggest that he was related to William. Had there been some link between them Burns might not have become so involved with the smugglers and dissipates of Kircoswald, whither he was sent to learn surveying—which, artistically speaking, would have been a great pity. It was there, incidentally, that he met one of his early poetic heroines and somehow became set on the slippery slope from trigonometry to orthometry. It is conceivable that had Burns come under the morally improving influence of Murdoch he would have lived longer, and perhaps it is significant that Murdoch's four score years on honest endeavour is remembered today by a solemn bust at 1, Grosvenor Place, while Burns' 37 years of vivid living is celebrated by a different sort of bust held all over the place, including Portrush. Which of the two is the nobler memorial must forever remain a matter of taste.

More Blarney

WHAT would happen if a new industry suddenly added 35,000 cu.ft. a day to the demand on a gasworks in England? Our bet is that the flags would go out and that there'd be drinks all round. Especially if the new factory was busy putting up further plant that would soon double its initial requirements.

But what happens when the same situation arises in the land of the leprechaun? Well, according to a report that has just fluttered off a pigeon's leg on the editorial desk, there appears to be alarm and despondency at Newtownards, Co. Down, because the newly formed Ards Glass Company has started up activities with five gas furnaces consuming 7,000 cu.ft. of gas a day each, and is building another five. 'The extra demand is having a serious effect on storage capacity,' complained Mr. William Scott, gasworks Manager. 'The Gas Committee should give it serious attention,' he added. And at a Borough Council meeting the Town Clerk was instructed to 'obtain further information.'

But deep down inside their husky exteriors surely these worried Ulster gasmen are just the teeniest bit pleased?

Personal Notes

MR. F. E. COX has retired from the post of Tiverton Engineer and District Officer under the South Western Gas Board after nearly 50 years in the gas industry. A native of West Bromwich, Staffordshire, Mr. Cox entered the gas industry at Tipton in 1908, whence he moved to West Bromwich as assistant Engineer and Manager. Seven years later he became Engineer and Manager of the Newport, Isle of Wight, Gas Company, attaining in the same year full Membership of the Institution of Gas Engineers. From 1947 onwards he was Honorary Secretary of the South Western Branch of the Gas Officers' Guild.

MR. ROGER BUNTING, who for 12 years has represented Cannon (GA) Ltd. in the South Western Gas Board Area, has been promoted to Branch Manager operating from the Cannon Showroom at 40, Easy Row, Birmingham 1. Mr. Bunting's duties will include the organisation and supervision of all the facilities provided in the Cannon Cookery and Educational Centre. MR. L. N. WILKES, Midlands Area Manager, will continue to be responsible for representation and sales in the South Western Gas Board Area.

MR. IVOR PREECE, of George Wilson Gas Meters, Ltd., has been appointed special representative for Radiant Heating, Ltd., in the Lincolnshire Division of the East Midlands Gas Board.

MR. H. P. LUPTON, Secretary of the Liverpool Gas Development Centre of the North Western Gas Board, has retired from the Industrial Gas Development Committee and the Gas Board. To mark the occasion he was presented with a radio receiver, for which he had asked. As may be judged from our picture, the receiver selected was of unconventional style judged by present-day standards, but the ceremony was followed by the further presentation of a cheque which Mr. Lupton was to use to purchase another receiver of his own choosing. Mr. Lupton has just completed the preparation of the proofs of his book on industrial gas, which he hopes to have published in the autumn.

Mr. H. P. Lupton (left) is seen with Mr. W. F. Howell, Secretary of the Manchester Gas Development Centre, who made the presentation.

MR. CYRIL H. PEARSON, Director of Parkinson & Cowan, Ltd., has been appointed Parent Company Director in charge of Parkinson & Cowan Gas Meters, Parkinson & Cowan Industrial Products and Parkinson & Cowan Group Exports. He has relinquished his appointment as General Manager of these Divisions. MR. J. R. ARMSTRONG has been appointed Divisional Manager of Parkinson & Cowan Group Exports; MR. F. J. BREWER, Divisional Manager of Parkinson & Cowan Industrial Products; and MR. E. J. SPURRIER, Divisional Manager of Parkinson & Cowan Gas Meters.

MR. WILFRED BESTWICK, M.B.E., of Kirby Bellars, Leics., Organisation and Methods Officer of the East Midland Gas Board, has been appointed to a similar post with the Nairobi (Kenya) City Council. He will leave Kirby Bellars in April, and after two months with a London firm of management consultants will leave for Nairobi by air in June.

Mr. Cyril H. Pearson.

Obituary

AIR-VICE MARSHAL O. G. W. G. LYWOOD, C.B., C.B.E., L.M., has died at his home at Woodlands, near Sevenoaks. Air-Vice Marshal Lywood had been a Director of the Automatic Telephone & Electric Co., Ltd., since his retirement from the R.A.F. in 1946. His senior appointments during the last war included those of Director of Signals at the Air Ministry and, from 1942 until his retirement, Air Officer Commanding No. 26 Group.

EX-BAILIE JAMES ORR MACNAB, former coppersmith and weighscale manufacturer, has died in Rothesay. He was the author of several inventions, among them being an improved system of gas street lighting, which was adopted by a number of British towns and cities.

MR. CLAUDE HANDFORTH, former chief cashier in the Gas Department of Belfast Corporation, died on February 5 after a short illness. He entered the service of the Corporation in 1905.

Diary

February 14. — BUILDING CENTRE FORUM: Store Street, Tottenham Court Road, London, W.C.2. 'Domestic Solid Fuel Appliances,' 6-7.30 p.m.

February 14. — WALES AND MON. JUNIORS, SOUTH WALES AREA: Cardiff. 'Pipe-line Butt-weld Inspection by Ultrasonic Methods,' Mr. W. Lloyd-Ellis.

February 14.—WALES AND MONMOUTHSHIRE JUNIORS: Llandudno Gas Showrooms, 2.30 p.m. 'Clean Air Bill,' by Mr. A. Searle, of Radiation Ltd.

February 15.—MIDLAND SECTION, I.G.E. (Spring Meeting): Queen's Hotel, Birmingham, 2.30 p.m. 'Experiments on the Hydrogenation of Oils to Gaseous Hydrocarbons,' by Dr. F. J. Dent.

February 15. — INCORPORATED PLANT ENGINEERS (Fifth Annual Dinner): Connaught Rooms, London.

February 16. — YORKSHIRE JUNIORS: York. 'Pre-Stressed Concrete Gas Holder Tank,' by Mr. T. Albone.

February 20.—LONDON AND SOUTHERN JUNIORS: Visit to Matchless Motorcycles works.

February 21.—MIDLAND JUNIORS: Visit to John Harper and Co., Ltd., Albion Works, Willenhall, 2 p.m.

February 21. — BUILDING CENTRE FORUM: Store Street, Tottenham Court Road, London, W.C.2, 6 p.m. 'Light Fittings.'

February 21. — INCORPORATED PLANT ENGINEERS, BLACKBURN BRANCH: Golden Lion Hotel, 7.30 p.m. 'The Application and Maintenance of Centrifugal Pumps,' by Mr. G. O. Stevenson.

February 25. — INCORPORATED PLANT ENGINEERS, WEST AND EAST YORKSHIRE BRANCH: Leeds University, 7.30 p.m. 'Fuel and the Future,' by R. H. Evans, Professor of Coal Gas and Fuel Industries, Leeds University.

February 25. — INSTITUTION OF GAS ENGINEERS: Joint Meeting with the INSTITUTION OF CIVIL, MECHANICAL AND ELECTRICAL ENGINEERS: The Institution of Civil Engineers, 5.30 p.m.

Britain's Tallest Shell-roofed Building

FIRST USE IN EUROPE FOR GAS PLANT

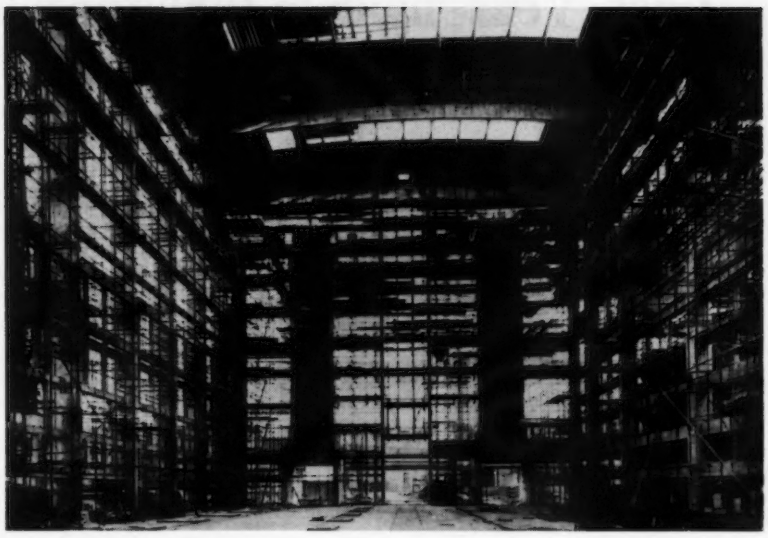
Will Give 100 Ft. Working Height

BELIEVED to be Britain's tallest shell - roofed building in the making, a construction now taking shape for the North Western Gas Board at Garston, Liverpool, will constitute the first use of this type of structure in Europe to house gas-making plant. The building has been approved by the Royal Fine Arts Commission.

Ten pre-stressed barrel vault shells, each 94 ft. by 32 ft., will be supported on slender columns, rising sheer from the foundations without any intermediate floors and giving clear working height of over 100 ft.

Four benches of intermittent vertical chamber ovens and associated producers will be housed. This and other works at Garston, including coal and coke bunkers, tunnel and substructures for coke handling conveyors, and ancillary buildings, are being carried out by Taylor Woodrow Construction, Ltd., for the main contractors, W. J. Jenkins & Co., Ltd., who are responsible for the carbonising and conveying plant extensions.

They are due for completion early in 1958 and will raise the carbonising capacity of the North Western Gas Board's Liverpool Group by 12-14 mill. cu.ft. a day. To effect early production of gas, the design and civil construction of the building and the installation of gas plant are taking place concurrently.



The shell-roofed superstructure now being erected for the North Western Gas Board at Garston, Liverpool.

Sc.G.B. NEGOTIATE FOR WIDER COKE OVEN GAS SUPPLIES

THE Scottish Gas Board are negotiating with the Colvilles group for coke oven gas from the Clyde iron works, Tollcross, and from the new coke ovens at Ravenscraig, Motherwell, when these come into operation.

Negotiations are also proceeding with Bairds and Scottish Steel, Ltd., with regard to supplies of gas from an extension to their existing coke ovens at Gartsherrie, Coatbridge.

The Board aim at creating a system of grid mains which will allow for increased supplies of gas either from their own works, situated at strategic points, or from coke ovens as supplies from these become available.

The new system of grid mains now being planned will allow for a considerable increase in the amount of gas which can be distributed throughout the area. At present only a very limited supply in Lanarkshire comes from coke ovens.

The policy of integration which the Board will carry out in the Glasgow and Western Division may mean the closing down of some of the smaller and uneconomic producing units.

SMOKELESS FUEL IS TOO COSTLY, SAYS LABOUR LEADER

WITH smokeless fuel so 'exorbitant,' it would be difficult to enforce smokeless zones, Alderman A. Sugden, the Labour leader, complained at a meeting of Dewsbury Town Council. He was referring to a decision by the Health Committee that consideration should be given to the possibility of declaring certain parts of the Borough to be smoke control areas.

With smokeless fuel at 9s. 6d. a cwt. he would not feel justified in ordering anyone to burn it. If the Government wanted smokeless zones the price of smokeless fuel should have more consideration given to it.

Japan Again Buys British

More C.W.G. Plant from Humphreys & Glasgow

ANOTHER order has been received by Humphreys & Glasgow, Ltd., for the installation of two carburetted water gas sets at the Kobe works of the Osaka Gas Company, Japan.

Both sets have been specially designed for heavy oil enrichment and the total output of the installation will be 10.5 mill. cu.ft. of carburetted water gas daily. The value of the order is about £0.25 mill.

The major part of the plant will be built in Japan and special equipment will be supplied from the U.K. by Humphreys & Glasgow Ltd. The installation is expected to be completed and put into operation early next year.

GASWORKS TO HAVE WELFARE BLOCK

Plans for the erection of a welfare block at the Pleck gasworks have been approved by the Public Works Committee of the Walsall Town Council. Included in the block will be garages for an ambulance and fire engine, as well as a surgery, canteen, and workers' changing room.

An official at the works said this week that the welfare block was being erected as more men were now employed.

January Coal Output Beats Last Year by 525,000 tons

MORE LABOUR AND BETTER WEATHER

COAL output at 22.5 mill. tons during the first five weeks of this year is 525,000 tons up on the same period last year. A bigger labour force and better weather are the main reasons for the improvement.

The average weekly employment in the industry so far this year is 4,800 higher than a year ago; in the week ended January 26 the labour force went up by 1,000. But the number of face-workers, though rising, is still below last year's figure by about 1,500. Coalface output per manshift is higher, largely as a result of the introduction of power-loading.

Commenting on these figures, the *Financial Times* points out in an editorial that if this record could be maintained, the coal industry should be able to increase its output for the year by a good deal more than the 1.25 mill. tons on which it is budgeting.

So far this year 182,000 tons of coal have been imported, compared with 635,500 in the same period of 1956. Exports and bunkers have amounted to 692,000 tons, against 840,000.

Inland consumption has so far accounted for 19.15 mill. tons, compared to 18.98 mill. a year ago. While consumption by industry, the collieries, and railways has gone down, electricity, gas, coke ovens, and domestic users have all taken more.

Distributed stocks dropped by 225,000 tons in the week ended January 26 to 16.09 mill., compared with 16.74 mill. tons a year ago; but the total level of stocks is almost exactly the same as last year at 18.89 mill. tons. Undistributed stocks at collieries and opencast sites are substantially higher than they were a year ago.

Electricity sent out for public supply from steam stations during the week ended February 2 amounted to 1,791 mill. units, compared to 1,875 mill. in the previous week and 1,908 mill. in the corresponding week last year.

Gas available at gasworks in the week ended January 26 stood at 13,634 mill. cu.ft., against 14,414 mill. in the previous week and 14,092 mill. in the same week of 1956.

U.S. GAS SALES BREAK RECORD

Natural Gas Wins Business from Manufactured Variety

TOTAL sales of the gas utility and pipeline industry last October amounted to 5,229 mill. therms, an increase of 11.4% over the corresponding period the previous year, and a record for the month, the Monthly Bulletin of Utility Gas Sales issued by the American Gas Association reveals. The increase is attributed to the 1.1 mill. customers added by the gas industry during the year and to a gain of approximately 7.1% in the industrial use of gas.

Natural gas sales were up by 13.2% while manufactured and mixed gas sales decreased by 26.2%, reflecting conversions during 1956 from these types of gas to natural gas.

During the quarter ended September 30 last, total operating revenues of the gas utility and pipeline industry reached a new high at $5,858 mill., a gain of 16.2% over the corresponding period of 1955. Operating expenses increased by $534 mill., or 15.7%, to $3,926 mill.

GOBBLE, GOBBLE WENT THE IRISH GAS COOKERS

Cheap and plentiful turkeys available in December were responsible for the leap in gas consumption over the Christmas period, Mr. William Scott, Manager of Newtownards (Co. Down) gasworks, told the Urban Council.

Mr. Scott said the output from 2 p.m on Christmas Eve till 2 p.m. on Christmas Day was 479,000 cu.ft., compared with 452,000 cu.ft. for the corresponding period the previous year. The peak hour on Christmas Day was 52,500 cu.ft.

The 1956 make of gas was 89.862 mill. cu.ft. compared with 87.427 mill. cu.ft. the previous year—an an increase of 2.434 mill. cu.ft.

News in Brief

GAS CONSULTATIVE COUNCILS COST £32,000 A YEAR

TOTAL cost of the 12 consultative councils for the year ended March 31 last was £32,169, the Minister of Power, Lord Mills, stated in the House of Lords last week.

This covered Chairmen's salaries of £750 a year each, staff salaries, and travelling and other incidental expenses.

Concerned over a fatal accident in a nearby town, The North Thames Gas Board have made a survey of gas appliances in pre-war Council houses at Maidenhead. They have recommended the provision of a gas point in the kitchens of a number of houses as an alternative to the gas wash boiler in the bathrooms.

Authority has been given to Coleraine Borough Council Gas Manager to arrange for the sale of gas appliances by ironmongers and plumbers on a commission basis. There will be two scales of commission, depending on whether the agent provides display facilities.

Guest of honour at the annual general meeting of the Wolverhampton branch of the Women's Gas Federation, last month, was Mrs. G. E. Abbott, Chairman of the National Executive Committee.

S.s. Royal Daffodil has been chartered by Thomas De La Rue & Co., Ltd., for a day trip down the Thames for their employees on June 22 starting from Tower Pier.

Replying to a Dewsbury correspondent's letter in a Leeds newspaper, the North Eastern Gas Board states that low pressure cut-off valves are not in general use in conjunction with prepayments meters since, despite extensive field tests, they are not yet wholly reliable.

Altogether 289 works and office personnel are eligible under a new long service presentation scheme inaugurated by Associated Lead Manufacturers Ltd. Of the 289, many are already past the 25-year qualifying period, some having completed more than 50 years' service.

Put forward by Aberdeen Corporation Finance Committee is a proposal to sell Corporation-installed gas cookers to municipal tenants, by instalments, if necessary.

Tenants of Corporation houses are to be allowed by Dunfermline Town Council to choose between gas and electric cookers and wash boilers.

Reconsideration is to be given by Prudhoe-on-Tyne Urban Council of its decision to install only electricity in 410 houses to be built at West Wylam.

Retiring after 35 years as yard foreman at the Uddingston works of the Scottish Gas Board, Mr. Thomas Gallacher was presented with an inscribed chiming clock by Mr. J. M. Dow, Divisional Controller.

IN THIS ARTICLE OUR INDUSTRIAL RELATIONS CORRESPONDENT DISCUSSES

The Issues Facing Leadership

AT no time in industrial history has Western Civilisation been surrounded by such a vast and complex variety of factors as today. Since none of us is at one and the same time an expert politician, economist, historian, statistician, theologian, educationist or psychologist, even the most able and educated, whether politicians or not, cannot thoroughly and adequately assess the real meaning of what is going on in the world around us. For not only do we find greatly differing opinions among experts in our own field as to the medicine that should be applied to the obviously ailing body politic, but we also find that our own proposed cure is nothing like that proposed by other experts, even if we can understand the terminology used by thinkers and writers in fields outside our own.

DIFFERING CURES

The result is that the poor ailing body politic is subjected to all sorts of differing treatments at different times. It lies there looking rather helplessly into the faces of the constant succession of 'doctors' crowding around him to 'cure' it. It knows that all the doctors cannot be right, for their differing cures cancel one another out. And so, in exasperation, it often feels that it would like to be left alone, and that the laws of nature be allowed to work out her own solution. For it sees the danger of being planned and organised to death. There are increasing signs that some people have had enough. They are no longer content to be guinea pigs for the experts and for the planners. As far as our own country is concerned, they are emigrating in large numbers to parts of the world where they feel they will be freer from the attentions of those who tax and organise us almost out of existence.

SIDE-TRACKING

What has brought about this state of affairs? Smuts, in 1943, attributed the failure of the 1919 Peace Conference to 'a process of side-tracking real issues and over-simplifying others'; and he prophesied that unless those twin errors were avoided at the next Peace Conference, it would be followed by 'even greater disasters than we have seen in the past.' His prophecy came true. Let us consider his warning, however, in terms of industry and commerce, and see whether we can pin-point some of the sins of omission and commission in these fields. Dr. Charles Morgan, the distinguished author, considers that the sins arise, in most cases, from 'failure to see, amid the conflict of experts, and the clamour of partisans, what the real issue is. The trouble is not so much that the wrong answers are given as that the right questions are not asked.'[1]

MEN OF THOUGHT

He would like to see, therefore, what he called 'humane counsellors,' that is, men of thought and imagination, who are not experts and who are not charged with administrative responsibility, admitted to the policy-making discussions of government and industry. The questions put by such men, when consulted, would, he thinks, lead experts into new lines of thought and bring them nearer to the real issues.

It was Plato who thought that until philosophers are leaders, or leaders have the spirit and power of philosophy, and political greatness and wisdom meet in one, and those commoner natures who pursue either to the exclusion of the other are compelled to stand aside, the human race will never have real freedom from evils, nor the State a possibility of life and be able to behold the light of day.[2] We must not be misled by orators who 'go ringing on in long harangues, like brazen pots which, when struck, continue to sound till a hand is put upon them.' The management of a state—and Dr. Morgan would say of industry as well—is a matter for the finest and most intelligent minds—that is, by the wisest men.[3] It was perhaps this context which Dr. Morgan had in mind when the made his fascinating suggestion about humane counsellors.

Let us consider what some of the more important real issues are in the terms of our industrial life, and, having discovered them, leave it to the judgment of each one of us, how far they have been sidetracked in the industrial life of this country.

REMUNERATION

When he is driven by economic necessity, it is a natural instinct in man anywhere and at any time to require and expect an intelligible and reasonable relationship between the energy and the skill and the hours he expends, and the reward he obtains. It is natural, and indeed essential, that both the employer and the employee should know, within fairly accurate limits, what the cost and the reward for the fulfilment of a certain task should be. What is the position in that respect in this country today? Both the employer and the employee find that the anticipated measure of remuneration, through the attentions of the Inspector of Taxes, has been hacked about, reduced, and altered out of all recognition. And that the wretched amount that is left is subjected to increasing costs of transport, rates, purchase tax, coal and food, to mention only a few.

Now the average hard-working decent man knows quiet well that he lives in society, and that that society must defend itself against external potential enemies, in the present world order. He is also aware that the less fortunate in that society should be protected against age, disease and want; and that the young must be educated. He knows that all this must cost money, and that he must bear his fair share of it. But he also knows that no organisation can exist where the outgoings are so heavy as to swamp income, and that any administration, if it is to be successful, must pay its way. The real issue here, therefore, is, that no matter what the arguments and pressures may be, if we allow them to force us into adopting a policy which militates against this fundamental instinct in man, it will defeat itself, for the resultant frustration and exasperation will sooner or later destroy it, with, however, much avoidable ill-will and waste having in the meantime intervened.

COMMUNITY AND INDUSTRY

Another real issue is that man is a gregarious animal. The average man must lead a communal life, otherwise he cannot properly develop and give of his best. It means that there must be an established community, especially where he spends most of his time; and that is, for most of us, our place of work. It also means that the community is more important than industry. Millions of people in the world today have not the remotest connection with industry. Yet they live and thrive. Remove them from a community, however, and they would pine away. A dirty, untidy factory where beats the pulse of a live community is a happier place than the most palatial place through which blow the winds of isolation and loneliness. A clean, tidy factory in the former instance would, of course, be better still. In other words, the purpose of our industrial activity is to establish a worthwhile community; the community is not there to be subservient to industry and commerce. A real, live, satisfying community is the end of endeavour, and industrial and commercial activity are some of the means with which to achieve that end. Aristotle puts it in a slightly different way when he says that the ultimate end of life is not its maintenance but the realisation of the best kind of life.

It must also be recognised as a real issue that there are definite limits, even for the most intelligent and developed among us, to man's intellectual and emotional capabilities. This is not an opinion, but a plain fact. The most advanced intellect

will always be wretchedly finite in its powers of comprehension, and our loyalties cannot stretch beyond a restricted field of experience. A large-scale organisation will always be up against this problem, and if it does not wish to side-track real issues, must continuously strive to solve it. They must be broken down to working groups of a size that can be grasped within the ambit of the average experience. There will thus be created small harmonious working groups within which individual people can continuously experience a satisfying community spirit. The current revolts in Poland and Hungary are explicable in large measure as a protest against the cold impersonality of large-scale bureaucratic control.

SENSE OF JUSTICE

Man in all ages and climes is imbued with an innate sense of justice. Any proposals from any side of industry, or from the Government, whose implementation militates against this fundamental instinct, are bound, sooner or later, to cause trouble, and will inevitably be swept away. But what a great deal of unnecessary suffering and resentment and frustration will they have occasioned in the meantime! Promotion based on factors other than merit and service will be regarded for what it is—a wrong and unjust thing. And the consequences flowing therefrom will follow as night follows day—a diminution in loyalty, a disinclination to work harder and acquire additional skill, a lessening of respect for management which countenances such injustice.

EFFICIENCY

The man of thought would also patiently point out, if his opinion were asked, that an organisation cannot be proficient which does not encourage a man to give his best. The consciousness of having done a job supremely well is one of the finest satisfactions known to man. An organisation must, therefore, if it wishes to be efficient, provide the practical conditions, as well as the necessary equipment and training and educational facilities to enable all those engaged therein to do the best that is in them. Not to do so on the ground of thrift of economy would be to sidetrack the problem. The real issue is whether the organisation exists to be as effective as possible. If it does, then it must provide the conditions and facilities indicated, wherever and however it can. Arguments about economy are a sidetracking of the issue; for it is by definition not true economy to run an inefficient organisation.

PRESTIGE

The absence of exact duplication of any single personality since the dawn of creation proves that each individual is a unique phenomenon with his own special characteristics and talents. It follows, therefore, that any organisation which values smooth running must acknowledge this inescapable fact. The main significance of our lives lies in fulfilling the tasks that lie to our hand. But those tasks are particular tasks, and the person who performs them is a particular person, who wants attention in particular and not in general terms such as labour force or establishment or other phrases so beloved of those prone to sidetrack real issues. In other words, no matter how 'lowly' the tasks may be, the individual performing them will want recognition and prestige. After centuries of distortion —that is, of sidetracking the real issues—of the degrees of status to be accorded to various tasks, this question of prestige and status has become hopelessly confused. In our age and day, in the U.S.A. and this country, if publicity and remuneration are the criteria of prestige and status, the merely physical proportions of certain female bodies seem to transcend in importance any other characteristics possessed by man. This question of degree is, of course, a slightly different question. The real issue is that all essential activity should be accorded recognition as such.

CURIOSITY

Man is always curious, not only about his origins and about his ultimate destination, but also—and this is the aspect about which we are concerned here—about the surroundings in which he finds himself, especially if they are of a more permanent character and affect his livelihood. Commonsense tells us that if a man is told of the reasons for the circumstances surrounding the tasks he has to perform, he will perform them more intelligently and, therefore, more efficiently. If we know the purpose and object of any task we have to perform, and its *raison d'être* in the general scheme of things, we shall perform it better than if it is surrounded by complete obscurity. But we must obviously be informed in language that we can understand. At long last this fundamental question of communication is receiving some attention in our more important industries. The man who gives orders must in the first instance understand what he wants done. He must then be able to convey it in clear unambiguous terms of the kind that the recipient of the order, the one who has to carry it out, can grasp.

Such orders should not only convey the actual details of what is to be done, but, wherever possible, of why it should be done; for otherwise, how can the recipient know that he has carried out not only the deed, but the intention behind the deed as well?

PATTERN OF WORK

One real issue often forgotten is that man cannot be happy unless he works to some form of pattern, that is to say, works in some context of discipline. Even children are happiest when they play *organised* games, and least happy when they are thrown on their own resources to play against a background of undisciplined chaos. This has, of course, something to do with recognition and prestige. Without a pattern to work to, how can man know whether he is doing well or not? Now the real meaning of discipline is not the knock-on-the-head or the sarcastic and wounding variety. That is not discipline. It effects nothing other than resentment and hostility. Discipline means the cessation of wrong methods, and the indication of the way to the right methods. It is positive not negative. It is channelling those lost on the broad highway of error, on to the straight path of truth. Discipline distinguishes between the wrong and right way of performing a task, and proves its point by actual demonstration or otherwise.

SENSE OF PROPERTY

Another innate instinct in man is to own something, to be able to regard something as his own special property. We are not concerned with morals here. But even if we were, we would be bound to say that there is nothing intrinsically wrong with this, nor is there with any other instinct. The wrong arises when it is abused. And because it is abused, the real issue has been sidetracked, and the possession of property and the acquisition of profit are now being condemned as something intolerable and not to be allowed in modern society. And there arises, therefore, a clash within ourselves between this view and another instinct previously mentioned: The recognition of the need to pay our way, not to take more out of the pot than we put into it. Profit is merely the surplus left in the pot, to safeguard us against less prosperous times, or to be used against greater struggles that lie ahead. It is in itself no more than what the squirrel does with acorns in autumn when he stores them away, or the dog when he hides a bone in the garden. But by sidetracking the issue, masses of people are led to wish the eradication of the thing itself, and not its abuses. The result has been an illogical and unfair system of taxation of personal incomes, and a great deal of unnecessary class hatred. For no system ever devised, now and in the future, can survive on a basis of neglect of profit, on the foundation of consuming more than is produced.

It is to basic issues such as these that the human counsellor, sitting among practical men of affairs, would, if asked, draw attention. In what measure and to what degree his counsel in the whirl and stress and speed of business, would be heeded cannot of course be prophesied. But he would have done his duty, he would have shown the light and the way, and we should all be the better and wiser men and women for his counsel.

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(1) Optima, A Quarterly Review, Vol. 3, No. 3, Sept. 1953, p. 4.

(2) Republic.

(3) Quoted from Protagoras, Sect. 329, in the Story of Philosophy by W. Durant, Ernest Benn Ltd., 1946, p. 29.

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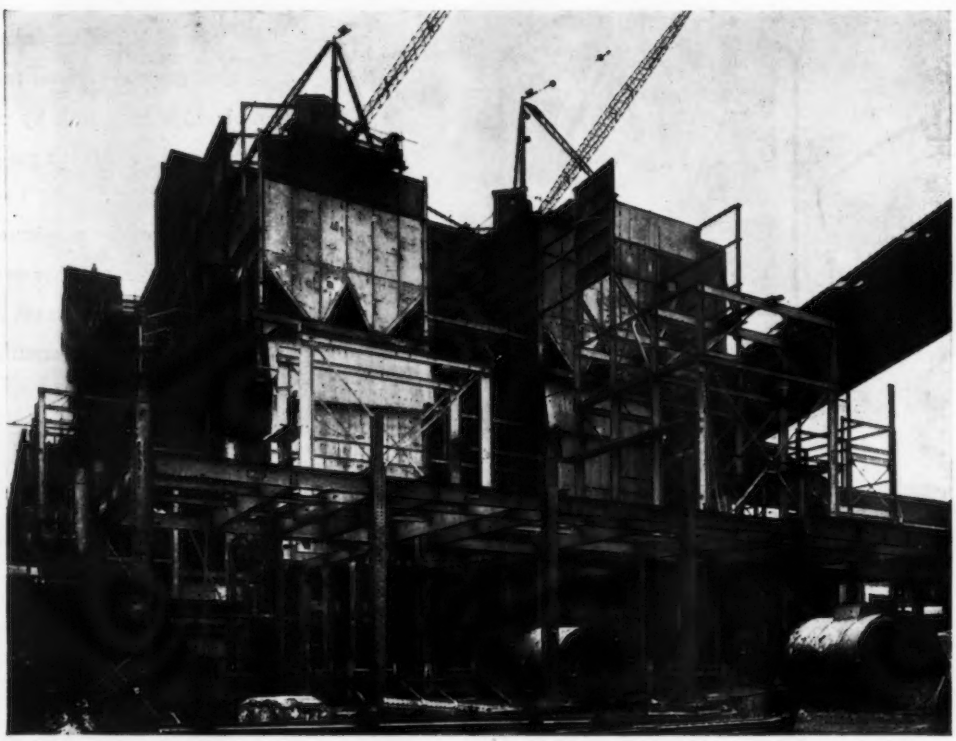

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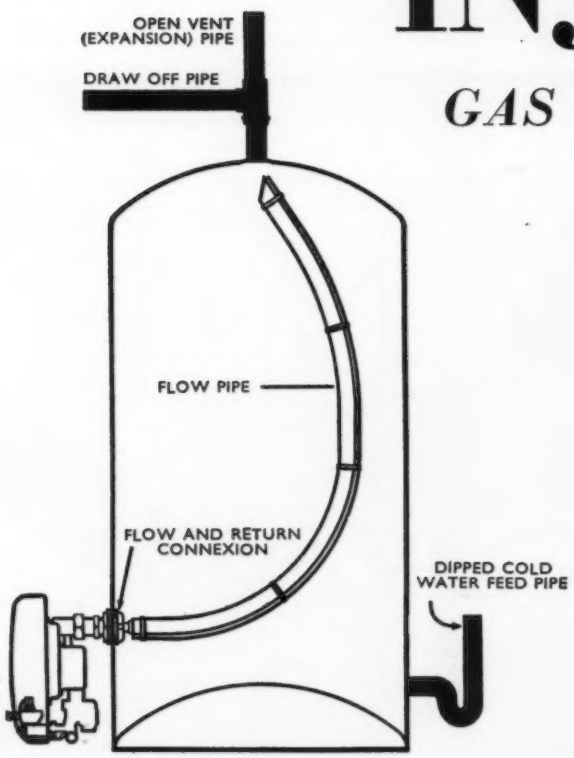

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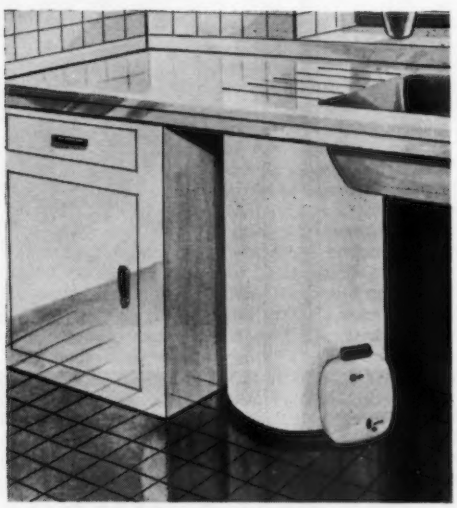

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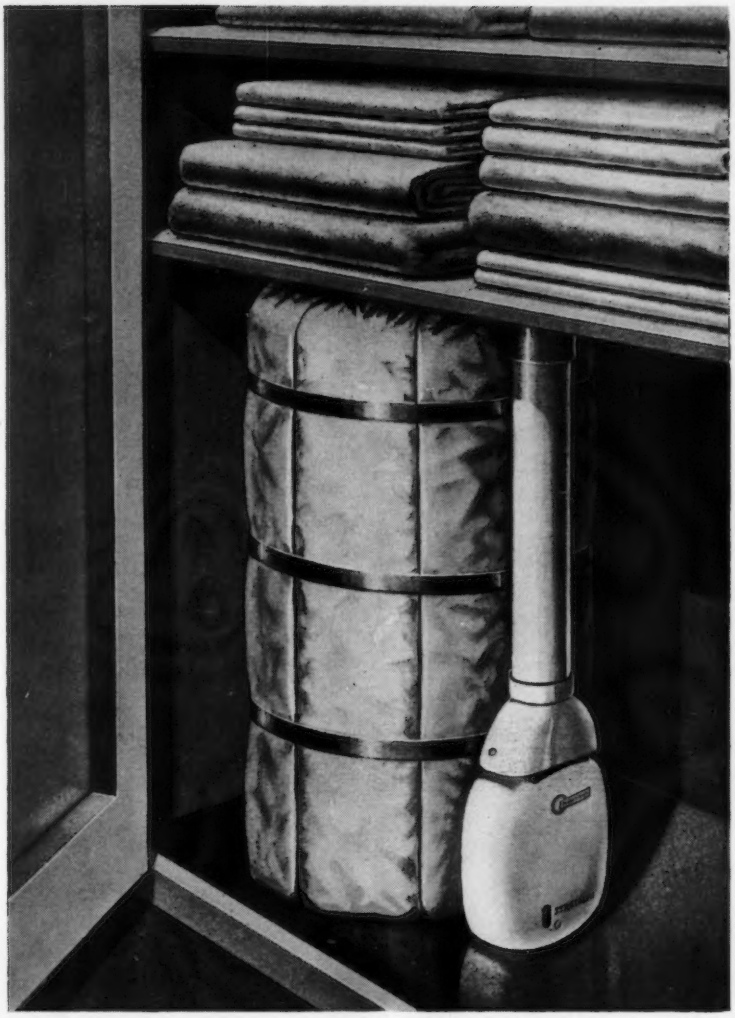

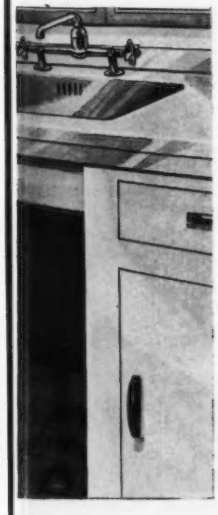

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From a paper to the Yorkshire Junior Gas Association, Harrogate, January 26

The Uses of Jet Burners—and Associated Problems

By T. WARD, B.Sc., A.M.Inst.Gas E.
NORTH EASTERN GAS BOARD.

GASEOUS fuels are burned in every conceivable appliance, the sizes of which vary with the duties to be performed and as a result a range of burners is available from the small 0.2 cu.ft. or 100 B.Th.U. per hour type, to the type used to fire Lancashire boilers with an input of 10,000 cu.ft. or 5 mill. B.Th.U. per hour. Although there is this wide difference in input, burners are not classified on this basis, but instead on the various means employed in mixing the combustible gases with oxygen, and fall into the following categories: Neat gas burners, low pressure aerated burners, premixed pressurised air or gas, tunnel or jet type burners, and oxygen enriched burners.

The science of burner design until recently has concentrated on improvements in the entrainment and mixing of air and gas, and on the attainment of the maximum rate of flame propagation throughout this mixture with the minimum absorption of the pressure energies available in the gas, or gas-air streams. The methods by which these ends are achieved vary in three ways, as illustrated in the above classification by types.

In neat gas burners, the gas issues from a jet formed in such a manner as to create turbulence, which draws in the air for combustion from the surroundings of the flame envelope. The design of these jets, whether made of ceramic or metal has reached a very high standard of efficiency. In this type of burner the rate of combustion is primarily controlled by the rate at which the air from the surroundings forms a combustible mixture with the issuing gas.

The low pressure aerated burner was first introduced by Bunsen and, in the familiar burner bearing his name, the gas draws a controlled quantity of air—approximately 50% of that theoretically required for combustion—up into a mixing tube.

Poor Degree of Mixing

This only results in a poor degree of mixing with streamlined flow conditions within this tube, but increased rates of combustion are achieved since only 50% of the air has to enter the flame envelope from the surroundings to promote complete combustion of the gas.

The premixed, pressurised air or gas type of burner follows directly from the Bunsen burner in that the whole of the air is introduced and mixed with the gas at a point before combustion has taken place. This is done by raising the gas pressure or by introducing air under pressure so that at the burner nozzle the air and gas are mixed in the correct proportions.

The rate at which combustion occurs in this type of system is limited, so that if the volume of mixed gases issuing from the nozzle is too great the flames will leave the burner and be extinguished. Under these conditions the flame speed is less than the mixture speed. It is clear then that the rate of combustion of a theoretical gas-air mixture is controlled by three major factors: (1) The degree of admixture of any primary air supply with the gas, (2) the rate at which air can diffuse into the gas from the atmosphere, and (3) the rate at which centres of combustion in this mixture can become sufficiently close to unburned portions of it to promote ignition.

This third factor is itself dependent upon such conditions as area of flame envelope, temperature of combustible mixture, together with the initiation, breaking and branching of chain reactions which take place before actual visible ignition. These and other complex factors may be said to be the physical constants of the mixture and burner type.

The fastest possible rate of combustion, then, has been obtained with the third type of burner by the manipulation of the air-gas mixtures, but it has long been known that if the flames from such systems are surrounded with refractory, or other suitable materials, rapid increase in combustion rate occurs as shown in Table I:

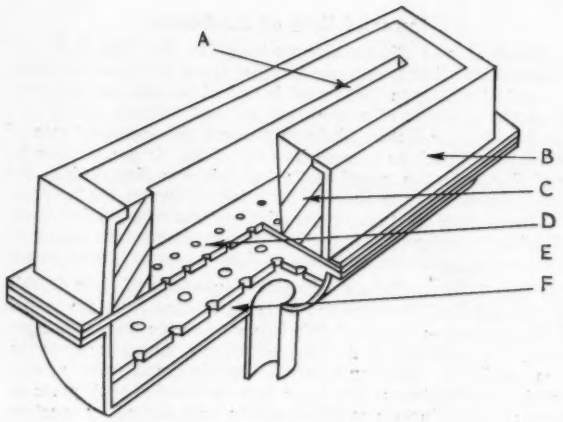

Fig. 1. Typical jet burner.

A: Burner discharge port.
B: Steel case.
C: Refractory tunnel.
D: Burner back plate.
E: Distribution plate.
F: Gas Mixture.

TABLE I

Burner type	Volume of gas burned cu. ft. hour	Volume of flame cu. ft.	Combustion rate, mill. B.Th.U. per cu. ft. of flame	Flame temp. °C.
Non-aerated	600	.45	.67	
Aerated	600	.65	.46	
Air blast	600	.145	2.07	1750 to 1850
Tunnel Burners ..	600	.00345	115	
Lucas combustor used in aircraft jet engines	10,000		10	

By this simple method a large increase in combustion rate, equivalent to 15 times that achieved by the transition from aerated burners to premixed burners, has been made possible, without any complex mixing and compressing plant being needed. Such an arrangement is known as a jet burner and is illustrated in Fig 1. Theoretical mixtures of air and gas are introduced to the mixture chamber, and then pass to the tunnel via a perforated back plate, where the mixture is burned at a high rate. The high temperature gases are then discharged at velocities sometimes greater than that of sound (737 m.p.h. at N.T.P.). This is considerably faster than the rate of discharge of the products from the combustion chamber of a gas turbine engine, which is of the order of 100 m.p.h.

The maximum temperature occurs about 1 in. from the burner mouth where the work to be heated is placed.

The Known Facts About Combustion

By what mechanism is the combustion rate increased? Unfortunately it is only possible to guess the answer, but a glance at some of the known facts about combustion may be helpful. Early workers[1] on this type of combustion came to the conclusion that the increase in combustion rate was primarily influenced by a catalytic reaction taking place along the refractory wall, which formed increased centres of combustion and caused the more intense combustion as shown in the

'porous bed' type of mechanism. Leason[2] working at Leeds University showed, however, that even at these high velocities, the tunnel walls held round them a cool zone or 'a dead space' though of a much reduced thickness compared with that of the normal Bunsen or air blast type of burner. From measurements of temperature and velocity distributions, he concluded that the mechanism of combustion differed little for these flames, and that the refractory tunnel merely provided an incandescent ring at the base of the tunnel which stabilised the reaction. The turbulent conditions which were present within the tunnel, gave rise to an increased flame area and accelerated the flame front.

Increased Rate of Combustion

Howland and Simmonds[3] working for the Gas Research Board found that turbulence in other types of burner systems, equal in intensity to that found in tunnel burners, did not produce the high rate of combustion per unit volume. They also examined other factors likely to produce this increased rate of combustion, such as a rapid heating of the air gas mixture by radiation from the tunnel walls, but this was discarded as the time allowed was too short to materially influence the reaction.

The effect of light on air gas mixtures was then studied, since Norrish[4] had shown that the combustion of ethylene could be accelerated under the influence of light waves of a wavelength of some 3,600Å. But as only small quantities of light of this wavelength could be recorded as being emitted from the tunnel wall, and intense light had little influence on the normal Bunsen cone, they concluded that its effects on tunnel combustion was negligible. Howland and Simmonds found from stroboscopic examination of the flame that combustion took place as a series of explosions at high velocity, and proved by spectrographic observations that the emission from the flame front is not typical of normal turbulent combustion.

The cause of these explosions is not altogether clear, so a short account of the combustion of static air-gas mixtures may possibly throw some light on the problem.

If a mixture of air and gas is exploded by means of a spark in a tube open at one end[4], the resultant flame travels from the closed end of the tube at a uniform velocity. Under suitable conditions it then passes through a transition period of vibrational movement and accelerates to detonation at sonic velocities.

Many workers, mainly Wheeler, Townsend and Garside[5], have shown that measurements of the flame speed of the normal Bunsen cone and the recorded speeds of this uniform movement in static mixtures, measured photographically, are similar. In the second stage of the explosion, where acceleration of the flame front is taking place, there is present in the tube a high concentration of shock waves which have long been associated with ignition phenomena and it is possible, under the influence of these shock or compression waves, that a flame front can be accelerated, retarded or even extinguished. These shock waves can be produced by external means, such as spark ignition, or spontaneously, in or just behind the flame front.

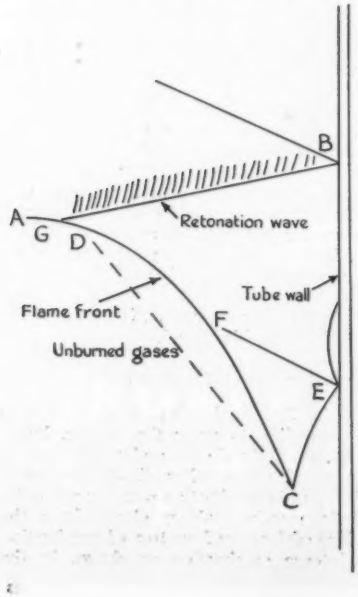

Fig. 2. The effect of shock waves on a flame front.

The effect of shock waves on a flame front is illustrated in Fig. 2. Here a flame front AC is being accelerated and overtaken by shock waves C.D.E.F., etc., originating in the flame front. When it has attained sufficient velocity under the influence of these shock waves, the flame front and these waves merge to form the detonation wave. At point C, a highly luminous wave is set up along the path shown, with the accompanying sound, characteristic of detonation.

Light-back of the Bunsen flame has been the subject of much research. This occurs when the ignition velocity is greater than the velocity of the mixture at the end of the mixing tube, a correction being required for the 'dead space'[5]. But it is strange that if light back has occurred, it is impossible to raise the flame again to the burner tip by a simple increase in the mixture rate. Turbulent flow within the tube has been suggested as a possible reason for this, but similar mechanisms to those operating within the explosion tube seem to be a more likely explanation.

On similar grounds can be explained, too, the rapid increase in combustion rate which occurs by surrounding a flame with a refractory tunnel. In this case when combustion takes place, compression waves are radiated from a point at the base of the tunnel and are reflected by its walls and strike the flame front which causes an increase in flame speed. This concept may also be applicable to the mechanism of normal combustion within a tunnel burner.

Noise Made by Tunnel Burner

The presence of shock waves is clearly shown by the terrific noise made by a tunnel burner. When these sound waves are of suitable wavelength and of sufficient magnitude, they produce a deafening resonance of the whole gas stream and as with resonance tubes, the frequency of noise emitted follows the normal laws of sound.

Tube length $= \frac{\text{wave length}}{4}$ with the first harmonic at $3\ \frac{\text{(wave length).}}{4}$ With coal gas the noise of highest intensity is produced with a tunnel length of $\frac{V}{4N}$, where N = noise frequency and V = velocity of sound in the hot products, and is approximately 8 cms.

This resonance will change in quality and note as the shock waves increase in intensity, but is primarily dependent on the tube dimensions, with length as the overwhelming influence. By plotting this air-gas ratio against the gas rate in cu.ft. per hour for different length of tunnel burners of the restricted outlet type with parallel sides it can be shown that noise in a burner is dependent upon the air gas mixture and tunnel length. The maximum noise liability occurs with mixtures, a little rich in gas of the theoretical where maximum flame speed occurs, but there is a definite tendency for noise to disappear with an increase in mixture rate until it finally disappears.

From photographical observations[3] of the flame shape where resonance occurs, combustion was found to be discontinuous and to take place as a series of explosions. This can be explained by shock wave theories as follows: When resonance occurs we have a shock wave travelling up the tunnel, and as it passes through the flame front it accelerates combustion. As it reaches the end of the refractory tunnel, however, a high intensity reflected wave is set up in the reverse direction which arrests combustion.

Extreme Turbulence

It will then be re-reflected at the back plate, and passing through will again accelerate the flame front. In this way extreme states of turbulence occur within the tunnel, and produce this form of vibrational combustion and bunching of the flames at the tunnel mouth.

By increasing the loading on the tunnel the liability to produce resonance is decreased until a point is reached where resonance disappears because, although shock waves are still being initiated in the flame front, they are not sufficiently in phase to become additive and produce resonance of the

whole mixture within the tube. This out of phase condition is due to the movement of the flame front and hence the source of shock wave up the tube toward its mouth.

Experiments have shown that by limiting the length of the tunnel, a permanent out of phase condition is possible and totally silent burners can be designed. It may well be that, under these silent conditions, the vital factors influencing the rate of combustion are the stabilising effect of the incandescent refractory at the tunnel base and the increased flame area which results from the turbulent conditions, as put forward by Leason.

Practical Advantages of Jet Burners

While much theoretical speculation and work has been done on tunnel combustion without achieving the complete answer to problems connected with its mechanism, the industrial gas engineer has been successfully applying tunnel or jet burners to many common heat processes. Tunnel combustion burners have certain advantages.

The rate at which heat can be transmitted to a solid surface by a gas flame is governed by two major factors: (1) Radiation from the flame, and (2) convection currents created by the flame raising the temperature of the boundary layers held round such surfaces.

Although some heat processes at present use flame radiation as the primary source of heat transfer, many more employ convection as the major heat mechanism.

Using convection for heat transmission, combustion products from the air gas mixture at a temperature of about 1,850°C. impinge on the material to be heated. By closely observing the impact of hot gases onto a cool surface, it is found that actual contact between these gases and the surface does not in fact take place, but that they do in fact pass their heat to a layer of stagnant gases held on the surface and raise the temperature of this layer, which in turn passes its heat to the material being heated. The rate at which heat transfer can take place, therefore, is dependent upon three major factors: Heat transfer coefficient of this boundary layer, temperature gradient across the layer, and the thickness of the layer itself, and can be calculated by the following formulæ $H = CTV^{\cdot 28}$ where:

H = Heat transferred to the body.
C = Co-efficient of heat transfer dependent upon surface to be heated.
T = Temperature gradient across boundary layer.
V = Velocity of heating gases.

From this it can be seen that the thickness of the boundary layer is decreased by increasing the velocity of impact of the gases issuing from a burner. Fig. 3 illustrates how the co-efficient of heat transfer increases with impact velocity. On this chart is shown the ranges normally covered by the types burners so far considered, and it will be noted that the high velocity discharge achieved in the jet burner can increase the heat transfer per unit area of surface some three to ten times that associated with the normal burner systems. This figure has been compiled from tests carried out at the Industrial Development Centre at Bradford, where the products of combustion from the different types of burner systems were allowed to impinge on a calorimeter which was itself carried on an accurate balance.

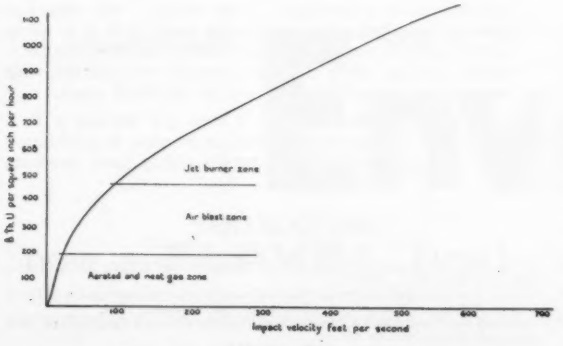

Fig. 3. Impact velocity per second.

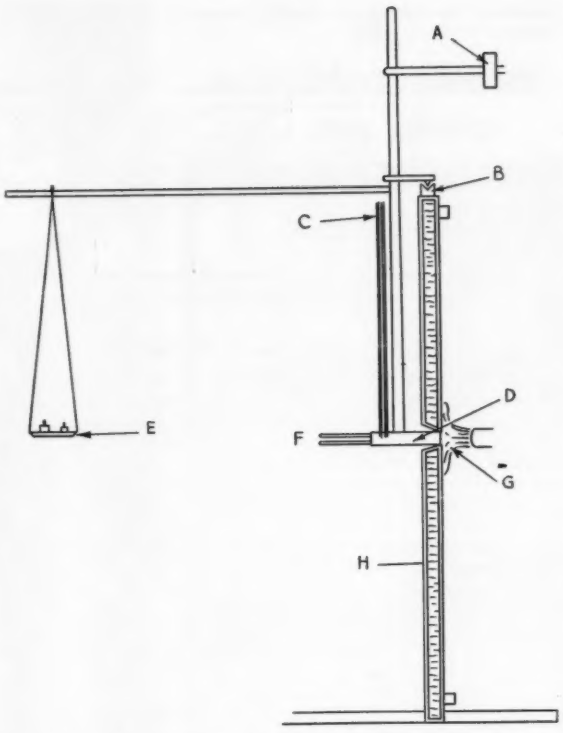

Fig. 4. Balance used for impact velocity and heat transfer tests.

A: Counter balance weight.
B: Knife edges.
C: Water lines to calorimeter fed from centre of rotation.
D: Calorimeter.
E: Scale pan.
F: Thermometers.
G: Flame.
H: Water filled surround.

From this apparatus, a sketch of which is given in Fig. 4, it was possible to find the rate of heat transfer from products to the water within the calorimeter. From readings of the weight required to balance the momentum of the products, direct comparison could be made of the velocity and heat transfer of the gas streams from various burner systems, and Fig. 2 could be compiled.

From these data the maximum rate of heat transfer from products to material being heated can be calculated from the following formulæ:

$$H = KTV^{\cdot 5}.$$

Where: H is the heat transfer per sq. in. per hour,
K the transfer co-efficient,
T the temperature difference in °F. between products and surface being heated, and
V is the velocity of products in ft. per second.

While heat input is shown to be vastly greater with tunnel type burners, the heat losses from a body being heated are the same regardless of this rate of heating and are the sum of conduction losses from the area being heated through the material itself and radiation losses which can be calculated as follows by the well-known formulæ:

$$\text{Conduction losses } H_1 = \frac{T_1 - T_2}{\frac{D}{AK}}$$

$$\text{radiation losses } H_2 = .173\ (T_1 - T_2)\ {}^{4}A.$$

If we require now to heat the whole of a material by placing it in the products of combustion, the heat losses by radiation to the surroundings and the rate of heat input will control the final temperature attained by the heat input being equal to the radiant losses. The temperature at which this equilibrium is attained is of the greatest importance and illustrates that much greater temperatures can be achieved by the use of tunnel type combustion, with its characteristic high velocity of waste gas impact on the surface being heated.

The times taken to reach this equilibrium and the temperature at which it is established are shown in the table below which

illustrates the remarkable results obtainable by this jet burner heating.

TABLE 2

	Temp. attained at equilibrium in °F.	Heat required to raise metal cube to equilibrium B.Th.U.	Velocity of products onto one face of cube, cu. ft. per sec.	Heating time required to reach equilibrium
				mins.
Jet burner .. .	1520	46.0	754.0	3.1
Air blast .. .	1100	33.3	56.8	7.2
Aerated .. .	810	24.6	24.7	12.3
Neat gas .. .	690	20.9	18.7	17.5

Experiments carried out on a one in. cube of steel.

Practical Applications of Jet Burners

By the reduction in heating times and the higher temperatures attained as shown in Table 2, the need for surrounding the work to be heated with an insulating refractory chamber to prevent heat losses has been much reduced, which has made possible the development of furnaceless heating. This is extensively used in industry for the heat treatment of metals, and it is possible by use of tunnel burners positioned correctly, to heat only a small portion of a complex structure without materially raising the temperature of the bulk of the piece.

A typical example of such an application is crank shaft hardening, which is done by positioning high intensity jet burners to impinge on to the journals, with a suitable mechanism to give the burners themselves the same throw as the crank, and by rotation of the shaft to achieve the even heating of the perimeter. Suitable adjustment of the burner outputs and the time of exposure allows very close control to be exercised over the temperature reached and the depth to which this heat has penetrated. When correct conditions have been attained the journals are quenched by a water jet and hardening has been accomplished with virtually no heating of the body of the shaft itself. By only heating a small portion of the shaft the fuel costs are very much reduced, and the whole process may be geared into the time and temperature control systems required in these days of automation.

Interest in this sphere of activity at the Industrial Development Centre at Bradford, arose from a lap welding process developed by the Leeds firm of Clayton Son & Co., Ltd., gas plant manufacturers. Here ¼ in. to 1 in. thick steel plate is rolled to form a 25 ft. length of tube varying in diameter from 18 in. to 72 in., in such a way as to form a lap joint with width of lap varying with plate thickness.

Saving Time and Fuel

The temperature of this joint is then raised to 1,500°C., and passed between rollers, under a pressure of 12.5 tons. Under this pressure and temperature, a weld of high quality is made. This is still the standard method of producing really first quality welded tubing, but the temperatures were attained by use of water gas with its characteristic high flame speed, and it was thought possible that both time and fuel could be saved by the change over to town gas.

Small experimental tunnel burners were made up which made very high rates possible, but when the size of burners had to be increased to the required dimensions, two major problems appeared. These were the life and strength of refractories, and the noise.

These burners are the largest of their kind yet made, and under operating conditions the burner tunnel attains a temperature of some 1,750°C. To withstand this temperature without erosion by the high velocity gases discharged from the tunnel exit, a very high standard of refractory is required with low thermal conductivity to reduce burner heat losses to a minimum.

The other properties needed by this refractory are that:

(1) The material must not subside or lose strength at a temperature as high as 1,750°C.

(2) It should resist thermal shock (the tunnel temperature is attained in some 30 secs.).

(3) The fired and unfired mechanical strength of the material should be as high as possible as curing of the refractory is never completed in a tunnel, and in the outer layers the material relies upon unfired strength.

(4) Volume stability should be considered of great importance as it will be realised that if curing is incomplete any shrinkage or growth on firing will result in distortion with its resultant cracking.

(5) Thermal conductivity should be low enough to reduce the inevitable burner losses to a minimum, because materials of high thermal conductivity will cause overheating of the perforated back plate which might cause ignition of the mixture behind this plate.

From an examination of the known materials the choice is limited to those with an alumina content greater than 60%, a silica content less than 36%, and impurities and alkali not exceeding 3%, and compounded with large 'grog.'

The surface of whatever refractory is used may be washed with a zirconia wash, which not only protects the refractory by filling in any fissures there may be present in the wall where failure is likely to start, but also if iron slag be deposited on the refractory the zirconia prevents contact between the liquid slag and alumina material and so avoids a serious failure.

The second and most serious problem with very large burners is the terrific noise produced. Here the tunnel length is of prime importance although there are other factors which also influence noise production.

These are: The metal or ceramic back plate, the tunnel form, the tunnel material and the tunnel exit.

The susceptibility of a tunnel to react to resonance has been found to depend upon the size of the perforations through which the gaseous mixture passes. The larger these are, the less likely is the tunnel to react as the flame front is reduced in area and is consequently positioned nearer the tunnel mouth. The maximum size of the perforations is, however, controlled by the extent to which the flame is to be reduced as the danger of light back increases as the area is increased.

For normal purposes perforations of No. 30 morse taper have been found most satisfactory when high degree of flame reduction is not of paramount importance, but this size must be reduced to No. 40-50 morse taper when this is required, though noise may be produced up to the middle range of output.

In every case ⅜ in. to ½ in. plate is used which provides plenty of area for heat dissipation by conduction from the tunnel base and prevents this plate from becoming overheated.

The basic tunnel form or section is of great importance if resonance is to be avoided, and the following general principles used as a guide:

i Wherever possible the parallel sided tunnel should be avoided, as stabilisation of the combustion is difficult within such parallel sections.

ii The tunnel for stability should be of a convergent section having equal taper to reduce reflection of sound shock waves within the tunnel.

iii Stagnant pockets of gas or areas of low velocity should be reduced to a minimum as turbulence occurring in these pockets may again cause instability.

iv A 10° to 20° taper is found to be most satisfactory in operation, but this is rather dependent upon the exit velocity required.

v It is important that burners be designed for the particular purpose for which they are required as is the general rule in all furnace work.

vi Excessive tunnel volume should be avoided because resonance is favoured by such conditions and the burner efficiency suffers seriously when the flame has to be reduced in an unnecessarily large tunnel. An empirical guide in calculating the area of the back plate is to allow 60,000 B.Th.U. per sq. in. and a tunnel length of approximately 2.5 in., both of which should be reduced with decrease in size of perforations in the back plate.

Test figures show that the use of coal gas enables a 50% reduction in fuel cost to be made and an increase in production rate, by a 44.5 minute saving in total welding time, becomes possible.

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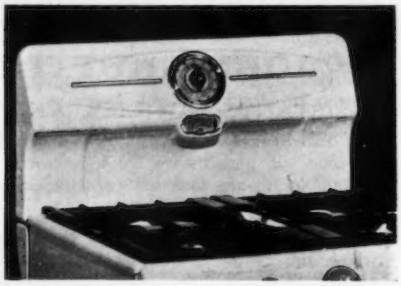

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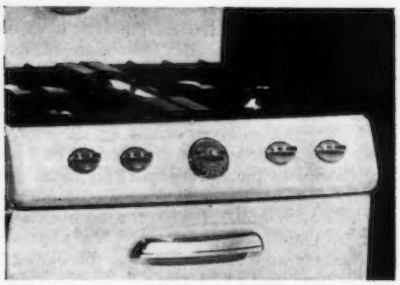

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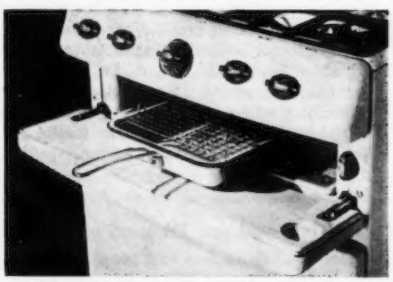

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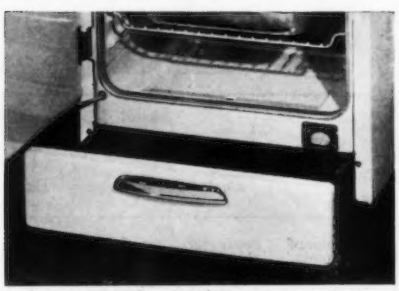

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From a paper to the Yorkshire Junior Gas Association, January 26

Two Special Problems Related to the Decommissioning of a Small Gasholder

By JOHN SHUTTLEWORTH, Assoc.M.Inst.Gas E.,
ASSISTANT ENGINEER AND MANAGER, KIDDERMINSTER GROUP, WEST MIDLANDS GAS BOARD.

THE purpose of this paper is to describe the methods by which the following two problems were dealt with at the Malton works of the North Eastern Gas Board, when a 200,000 cu.ft. capacity gasholder was taken out of commission to allow extensive repairs to be carried out: (1) The treatment and disposal of holder tank water; and (2) the provision of temporary peak load plant to compensate for limited holder storage.

In recent years, the river boards have been granted increased powers to enforce the prevention of river pollution and the problem of holder water disposal has become more acute. However, since the nationalisation of the gas industry, every effort has been made to achieve higher standards in the prevention of river pollution by water or effluents discharged from gasworks. Water may be disposed of by agreement with the local authority to the sewers, but this method presents certain difficulties as the disposal water should not contain any substances which will interfere with the normal sewage disposal process. It is, therefore, important when a gasholder repair becomes necessary and the tank has to be emptied that adequate consideration should be given to the problem of water disposal.

When a holder which represents two-thirds of the total storage on a works is taken out of commission for six months, the problem of limited gas storage must also receive due consideration.

While adequate coal gasmaking plant may be available on a small works to overcome this difficulty, in most cases it is not economic to maintain additional coal gas plant under fire for six months, which would only be required to produce gas for the one or two hours peak output. Apart from the economics when considering the provision of peak load plant, it should be appreciated that works of this size have very limited reserves of labour, and any plant when finally installed should, therefore, require the minimum of labour for satisfactory operation.

Treatment and Disposal of the Holder Tank Water

The two methods which were considered for disposing of the holder tank water were: (a) Discharge of the water to the local authorities sewers; and (b) discharge of the water to a river which bordered the works.

The chief objections to discharging the water to the sewers were the possibility of smell escaping into the streets of the town through manhole covers, etc., and that the sewers in the gasworks area ran almost to capacity during the daytime and any substantial additional discharge into the sewers would bring into operation a stormwater overflow to the river. The discharge of water to the sewers would, therefore, have to be limited to the late evening and the night hours, and even then the flow would be severely restricted. If the water was chlorinated the naphthalene odour prevailing would possibly give rise to complaints if discharged to the sewers. Various experimental work was carried out in collaboration with the Chief Inspector of the Yorkshire Ouse River Board and the Fisheries Officer in treating the holder water with a view to eventual discharge to the nearby river.

It will be observed from the analyses (Table 1) of several samples of water which were taken at various depths in the holder tank that the water definitely came under the category of 'poisonous, noxious or polluting' as far as the River Board were concerned. Initially, experiments were carried out with a view to eliminating the odour from the water by the addition of chlorine in the form of cloros. It was found, however, by this treatment that the water still had naphthalene odours, and even more important, that by chlorination chloro-phenols were produced which were even more toxic than the original phenol constituents in the holder water. When samples of holder water were diluted, it was found that specimen fish lived in solutions of one part in 100 parts of holder water but did not survive in one part in 10 parts.

It was eventually decided, in conjunction with the Chief Inspector of the River Board and the Fisheries Officer, that the method of treatment prior to discharge should be by aerating the holder water with compressed air followed by oxidation with potassium permanganate, thereby reducing the oxygen absorption value of the water. The water was to be discharged to the river from suitable sprays erected along the river bank which would have the effect of producing additional aeration by atomisation, and ensure maximum distribution of the holder water over the area of the river. The initial rate of discharge of treated water to the river was not to exceed 4,000 gal. per hour, and thereafter the rate was to be determined by the River and Fisheries Board officials. The holder tank was situated below ground and the calculated quantity of water for disposal was approximately 600,000 gal.

The sequence of events was as follows: On Tuesday the

TABLE I
TESTS CARRIED OUT ON GASHOLDER TANK WATER

Sample taken from	Physical Characteristics				Results of Analysis, Parts per Million								Remarks
	Liquid	Sediment	Odour	Reaction to Litmus	pH	Ammoniacal Nitrogen	Oxygen absorbed in 3 min. test	Oxygen absorbed in 4 hr. test	Alkalinity in terms of $CaCO_3$ MO	Thiocynate in terms of Sulphur	Monohydric Phenols in terms of Cresol	Cyanide	
Bottom of Tank	Fairly turbid greyish brown	Small light brown	Pronounced Coal Gas	Slight Alkaline	7.0	125	37	82	400	2.0	6.5	*Nil*	
10-ft. down	*do.*	*do.*	*do.*	*do.*	6.9	105	35	80	375	1.9	6.5	*Nil*	
Surface	Slight turbid greyish	Small greyish brown	Slight Coal Gas	Slight Alkaline	6.7	19.7	1.0	2.0	70	*Trace*	0.7	*Nil*	Samples taken during heavy rain, hence this sample would be mainly surface water drainage.

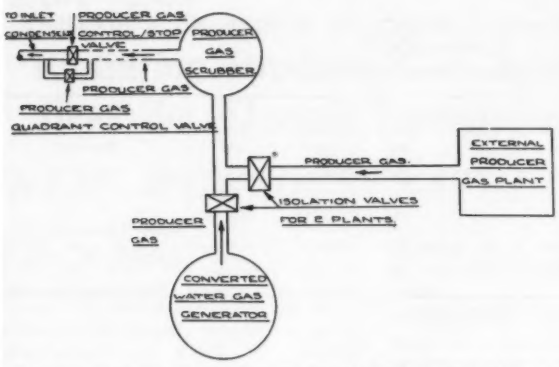


Fig. 1. Diagrammatic arrangement of producer gas plant and converted water gas generator.

holder was taken out of commission; on Thursday purging was completed and aeration by compressed air commenced; on Friday 3 cwt. of potassium permanganate crystals were added and aeration by compressed air stopped. Discharging treated water to the river commenced. From Saturday to Monday, there was discharging continuously day and night until the sludge depth was reached at dusk on Monday. The sludgy water was later pumped into a large settling tank where the solids were allowed to settle before the top water, which was first tested for O/A value, was pumped into the river.

Atomisation was effectively achieved by delivering the water from $\frac{3}{16}$ in. diameter jets and also by deflecting the water from fire hose jets against curved corrugated sheets placed directly under these jets. The treated water was thus sprayed into the river to cover a large surface area of water. An important factor which greatly influenced the rate of discharge and allowed of a greater quantity of water to be disposed of per hour than was originally anticipated was that from the start of the operation the river was in semi-flood conditions. There was continuous co-operation during the whole of the discharge operation between the River and Fisheries Board officials and the Gas Board technical staff.

Practical experiments were carried out by placing caged fish downstream in the river. Several rainbow trout were placed in a cage which was left in mid-stream each day. The majority of these fish did not survive when subjected to this treatment for 24 hours. The opinion expressed after expert examination was that they had died from silted gills, damage to their scales and general fatigue caused by the strong current and heavily silted flood waters and not from any form of river pollution. Also at no time were any dead fish observed at a point lower down the river where a careful watch was kept.

Holder water samples were taken at least every four hours and both standard three-minute and four-hour absorption tests were carried out. The standard three-minute O/A test gave very consistent results and these quick tests were most useful in providing an accurate and rapid indication of the general trend of the oxygen absorption values.

By the aeration of holder water it was possible to reduce the oxygen absorption value from 80 p.p.m. to 40 p.p.m. By the addition of potassium permanganate it was possible to reduce greatly the obnoxious odour and to reduce further the O/A of the holder water. After this treatment the characteristics of the holder water remained relatively constant until pumping approached the sludge depth. The treatment and the rates of discharge employed obviated harm to fish life in the river and no complaints were received.

Provision of Temporary Peak Load Plant

The only alternative gasholder available for storage while the 200,000 cu.ft. holder was out of commission, was a two-lift 90,000 cu.ft. capacity holder. The output for the maximum day exceeded 400,000 cu.ft. and the peak hourly demand was over the lunch-time period of each day, especially on Sunday and Monday when the output could reach 40,000 cu.ft. per hour. To provide adequate district pressures it was imperative that the 90,000 cu.ft. holder should remain cupped until 12.30 p.m. each day during the week and until 1 p.m. on Sundays.

The two methods which were available for overcoming this difficulty, apart from maintaining additional coal gas plant under fire, were, by using additional storage capacity in the form of a high-pressure gas container and a compressing unit and by the use of butane gas diluted with producer gas to meet the peak gas requirements. It was decided to use the second method since it appeared to be the most practical and least expensive way as there was already surplus producer gas available for dilution purposes on the works.

The carbonising plant consisted of nine beds of stop-ended machine charged horizontal retorts with an external producer gas plant for dilution purposes. During the normal summer period with both holders in commission the output was usually met by working five beds of retorts. It was thus decided that it should be possible to meet all gas requirements when the holder was out of commission by maintaining six beds of retorts under fire and augmenting the coal gas production at peak periods with additional producer gas and butane.

Theoretical Considerations

Graphs were produced showing the estimated quantity of mixed gas required each day for a maximum and a minimum week during a normal summer period and from these was calculated the approximate quantity of butane which would be required while the holder was out of commission. The graphs indicated that the period of butane/producer gas augmentation would have to be carefully balanced against the output and the normal gasmaking capacity of the coal gas plant. In other words, if butane/producer gas augmentation were carried on too long at peak periods, insufficient storage would be available for the normal coal gas make during non-peak periods and this would result in coal gas plant standing unnecessarily during the night. This factor was subsequently proved in practice, and the graphs were most useful in the initial experimental stages in assisting with the balancing of loads when the gasmaking routine was being established. Various calculations were also made to obtain such information as the percentage of butane required to give a mixed gas at the declared C.V. and the estimated specific gravity and Wobbe Index of the mixed gas.

Butane Enrichment Equipment

The butane enrichment equipment used at Malton was a portable unit within the Board and had previously been installed at the Spenborough works. The butane was collected in 400 gal. capacity (one ton) steel cylinders and supplies were obtained from Shell Mex and B.P., Ltd., at Stanlow, by road. A total of four cylinders were available for use and two cylinders at a time could be conveniently carried on a standard 4-5 ton works lorry. It is not proposed to describe the layout of the injection equipment here as this was dealt with in full by Mr. J. M. Gaunt in his paper entitled 'The Use of Butane for Peak Load Requirements,' which he presented to this Association in March, 1954.

A diagrammatic arrangement of the equipment as used at Malton is shown in Fig. 2. The butane passed direct through

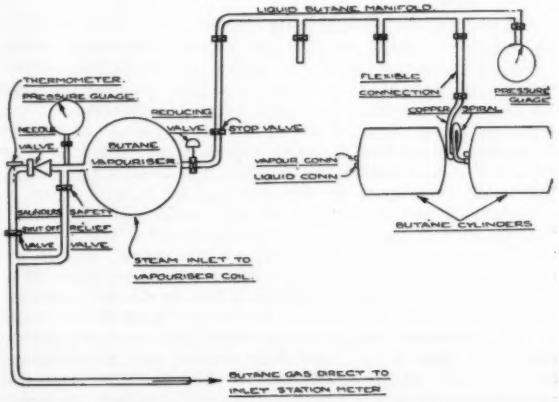


Fig. 2. Diagrammatic arrangement of butane injection equipment.

TABLE II

DETAILS OF TRIAL RUN CARRIED OUT ON SUNDAY, MARCH 13, BEFORE NO. 1 HOLDER WAS TAKEN OUT OF COMMISSION

(No. 1 Holder was temporarily shut-off during this trial)

Time	Estimated Coal gas make + dilution cu. ft.	Estimated butane/P.G. make cu. ft.	Total gas make uncor'd cu. ft.	No. 2 holder stock cu. ft.	Gas output uncor'd cu. ft.	Make gas C.V.	Town gas C.V.	Town gas Wobbe Index	Make gas sp. gr.	Town gas sp. gr.	Remarks
9 a.m. ..	—	—	—	86,900	—	470	495	690	0.555	0.515	
10 a.m. ..	14,500	1,300	15,800	85,000	17,700	500	505	690	—	0.540	Butane/PG on 9.45 a.m.
11 a.m. ..	14,500	8,800	23,300	83,600	24,700	480	500	630	0.710	0.614	
12 noon ..	14,500	9,100	23,600	68,900	38,300	510	495	620	0.723	0.640	Butane/PG off 1.0 p.m.
1 p.m. ..	14,500	8,600	23,100	53,800	38,200	545	510	630	0.723	0.667	

N.B.—No. 2 Holder uncups at approximately 45,000 cu. ft.

a 2 in. diameter pipe to a point near the inlet of the station meter where it was injected into the gas stream.

There was no provision for measuring the output from the producer gas plant.

Experiments Before Decommissioning No. 1 Holder

Certain experimental work was carried out before the 200,000 cu.ft. holder was put out of commission to ascertain if it would be possible to produce the theoretical quantities of butane/producer gas which would be required to meet the peak load requirements. During these experiments, most of which were carried out on the days in the week when peak loads occurred, the 200,000 cu.ft. holder was shut off and the peak load requirements were met by augmenting the normal coal gas make with butane/producer gas.

It was found that by increasing the normal exhauster pull by approximately 4/10-6/10 in. W.G. it was possible to increase the capacity of the external producer gas plant to well over 8,000 cu.ft. per hour, as compared with a nominal capacity of 2,500 cu.ft. per hour, and this procedure worked satisfactorily. A Wobbe Index recorder was installed on the works and this proved most useful during periods of butane producer gas augmentation. A typical trial run which was carried out using butane/producer gas augmentation is shown in Table II.

Butane/Producer Gas Augmentation

From the experiments carried out, a simple routine was adopted for commencing and ceasing butane/producer gas augmentation. To commence butane injection it was only necessary after turning on steam to the vapouriser to open the control valve from the cylinder being used and then to adjust the needle valve to the desired setting to allow butane to pass forward into the gas stream. Increased producer gas for butane dilution purposes was normally admitted approximately 30 minutes before opening the butane control valve.

It was possible to augment fully with butane/producer gas within 60 minutes of turning on steam to heat up the vaporiser and thereafter the rate of augmentation could be conveniently controlled by regulating the producer gas diluent control valve or by varying the opening of the butane needle control valve.

While augmentation was being carried out it was the practice to maintain a constant watch on the calorific value of the make and town gas and of the town gas Wobbe Index so that the rate of butane admission and producer gas dilution could be adjusted accordingly. By following this procedure it was found that the C.V. of the town gas remained reasonably constant, and after the initial experimental period when a routine had been established the plant was usually operated by the works foreman during the course of his normal duties.

Changes in air temperature affected considerably the vapour pressure of the butane in the cylinders, and it was observed that on cold mornings when the air temperature was in the region of 40°F. the cylinder manifold pressure may have fallen to as low as 15 lb. per sq. in. while later in the day, after the cylinder had been subjected to direct heat from the sun with an air temperature of 60°F., the manifold pressure could be over 30 lb. per sq. in. Very little warning was given when a cylinder was nearly exhausted. In practice the manifold pressure usually dropped within 20-30 minutes from the working cylinder pressure to zero, when the cylinder was found to be empty.

It should be mentioned that during the first week after the holder had been taken out of commission, it was evident that the retort charging cycle would have to be altered as undue fluctuations of the make gas C.V. were taking place due to the frequent variations in the number of retorts being charged. These fluctuations were reflected to a certain extent in the town gas C.V. due to the very limited storage capacity which did not allow adequate mixing of the gas to take place before it was sent out to the district. The retort charging cycle was, therefore, altered so that fewer retorts were charged at a time, but the charging times were more frequent. By so doing, the C.V. of the make gas evened out considerably, and it was possible to maintain a fairly constant town gas calorific value throughout the whole of the 24-hour day.

Cost of Production

The total cost of the liquid butane, including transport and handling charges from Stanlow to Malton, was £24 16s. 0d. per ton. Details of the operational costs per therm of added butane/producer gas at Malton are given below:—

	Pence per therm
Liquid butane requirements	8.7
Transport and handling charges of liquid butane	1.7
Steam requirements for vaporiser	1.0
Coke and labour requirements for producer gas	1.3
Total cost per therm of added butane/producer gas	12.7

It should be noted that the above cost does not include capital charges.

This cost per therm is reasonable, and considering the small capital required for erecting the plant it compares favourably with the results which could be obtained from other forms of peak load plant. If coal gas plant had been used to meet the peak load requirements, then at least three additional beds of retorts would have had to be maintained under fire during the six-month period, and the estimated cost of providing coke and labour for this would have been over £2,000. This compares most unfavourably with the figure of £300 which was the approximate cost of providing butane/producer gas during this period.

The butane plant was extremely simple to operate although, due to the high percentage of augmentation gas which had to be produced during peak load periods, frequent attention was necessary to adjust the rate of butane injection with the quantity of producer gas added. It was possible to increase the production rate at sudden peak periods by up to 50% with butane/producer gas augmentation without seriously affecting the flame characteristics of the resultant town gas. The operational costs per therm of added butane/producer gas were reasonable, being in the region of 13d.

B.I.M. To Hold Conferences

THREE conferences on management principles and practice will be organised this spring by the British Institute of Management. Each of them will bring to an industrial area of Britain a cross-section of the best national resources of knowledge and experience in management subjects. Further particulars may be obtained from the British Institute of Management, 8, Hill Street, London, W.1.

TRADE NEWS

Radiation Produce Gas Appliance to Beat the Electric Immersion Heater

NEW WORLD STRATALYN ST 12

THE New World Stratalyn ST12 injector gas water heater, the result of close collaboration betwen the South Eastern Gas Board and Radiation, Ltd., is designed to simplify installation under circumstances in which the electric immersion heater has hitherto found favour, and at the same time to attain the highest degree of stratification in the storage cylinder and the high potential draw-off rate which gives the storage type of installation its characteristic advantages.

Particular attention has been given to ensure maximum durability of all component parts and to provide ready access to the burner and Regulo controls and for periodic inspection. Access is gained to the burner by removing the outer vitreous enamelled case after releasing a single thumbscrew, and to the heat exchanger by further releasing two bolts securing the Radaloy combustion chamber.

Safety Device

The burner is rated at 6,000 B.Th.U. per hour and consists of five miniature Bray jets screwed into a cast iron float. Gas rate control is by a governor and adjustable restrictor, and a pilot safety device is an integral part of the burner. The pilot flame is protected by a filter.

The heat exchanger comprises an aluminium block into which chromised steel fins are die-cast, and to which is bolted the copper water section. The required degree of thermal contact between heat exchanger and water section is ensured by an intermediate layer of conducting paste.

Temperature control is by means of a single lever Regulo located in the water section, so that it responds to the return water temperature.

Water Connection

The single water connection at the top of the water section is a ¾-in. B.S.P. union with tailpiece which screws into the storage vessel tapping. The flow connection is located inside this union, and is a short brass tube to which is clipped the steam quality rubber tubing, with supporting wire and clips, forming the flow pipe.

In order to gain full advantage from the single water connection, the distance between the connection and the base of the Stratalyn has been kept to a minimum. Some storage vessels have a tapping near the base for an electric immersion heater, and this may serve for the Stratalyn. Alternatively, a 1-in. B.S.P. tapping can readily be provided by the use of fittings, such as an Essex flange.

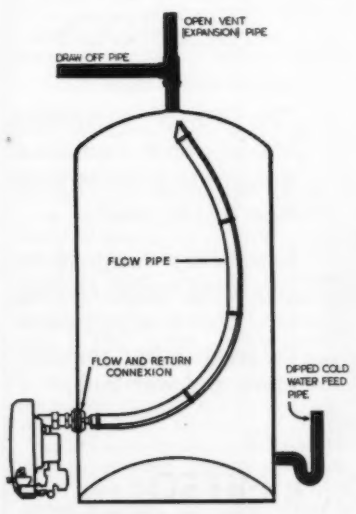
Before connecting the heater to the storage vessel, the flexible flow pipe is inserted into the tank or cylinder and then cut to length. A suitable bush is screwed to the union tailpiece of the Stratalyn and the rubber flow pipe clamped to the flow tube. The pipe is then re-inserted into the vessel and the connection screwed home.

Flue Not Needed

Its low gas rate enables the Stratalyn to be used fluelessly in well ventilated places, thus the heater is available with a flue cap. For operation with a flue, a draught diverter is supplied. Many linen cupboards will accommodate the Stratalyn because of its small size, in which case venting may be effected through a wall of the cupboard, e.g., into a hallway. In some installations, it is convenient to flue into the roof space.

The Stratalyn meets the requirements of B.S.1250, and has been accepted for inclusion in the Gas Council List of Tested and Approved Domestic Gas Appliances.

The thermal efficiency of the appliance is 75%, giving an hourly output of 5½ gal. of water raised through 80°F. When heating an 18½ gal. capacity insulated cylinder, the first 2 gal. may be drawn off after 30 minutes at a mean temperature rise of 60°F. and after one hour 5 gal. may be drawn at a similar temperature. After the Regulo has shut down, the mean temperature of a 16-gal. draw-off is 140°F.



Sectional diagram showing New World Stratalyn water heater No. ST.12 connected to a 30-gal. storage cylinder.

The New World Stratalyn injector gas water heater No. ST.12 by Radiation, Ltd.

Mixing Minimised

A high degree of stratification arises from the use of a flow pipe injecting the heated water very close to the top of the storage vessel, so minimising mixing with the cold water. As heating continues, the hot water displaces the cooler water downwards, until the whole contents of the vessel are heated and the Regulo cuts down the gas supply.

The thermal insulation qualities of the rubber flow pipe are such that conduction from the heated flow water to the cooler vessel contents is negligible. The good stratification performance enables the Stratalyn to be used as a simple bulk heater for obtaining small quantities of hot water quickly. It is only necessary to turn off the gas when sufficient hot water is available for needs.

Over-all dimensions of the ST. 12 Stratalyn are: Height with draught diverter, 14½ in.; height with flue cap, 11 in.; width, 8¾ in.; depth (projection from storage vessel), with draught diverter, 7⅛ in.; with flue cap, 6½ in.—*Radiation, Ltd., 7, Stratford Place, London, W.1.*

Fluidrive News

Details of the application of Fluidrive to a diesel driven piling winch are among other interesting items in the January edition of *Fluidrive News.—Fluidrive Engineering Co., Ltd., Isleworth, Middlesex.*

R. & A. Main, Ltd., announce New and Improved Refrigerator

BUSINESS OF SUBSIDIARY TAKEN OVER

MAIN REFRIGERATION, LTD., formed as a subsidiary company of Glover & Main, Ltd., to manufacture and market refrigerators, has ceased to trade and R. & A. Main, Ltd., have taken over the responsibility of manufacture and marketing of refrigerators. At the same time, the Company has released details of a greatly improved model for 1957, the Main No. 36 refrigerator. This has the same outer cabinet as the 3.2 cu.ft. model but the internal capacity has been increased to 3.6 cu.ft. and the shelf area from 6.3 to 7.0 sq. ft. by the addition of a recessed door lining fitted with an egg rack to hold eight eggs, and with two shelves, one to hold three one-pint milk bottles and the other for smaller bottles and for fats.

Price Unchanged

Despite the enhanced appearance and increased capacity and in spite of ever-increasing production costs, the price of the Main No. 36 will be the same as for the No. 32 model—£72 9s., including purchase tax. In addition, this refrigerator will continue to carry a ten-year guarantee on its sealed cooling unit.

Modern and attractive in design, its appearance is further enhanced by its pleasantly bowed top and shaped door. The door is secured by a positive catch and closes at a touch. Immediately beneath the door is a hinged plinth panel giving access to a useful dry storage compartment in the plinth base. This compartment of 1½ cu.ft. capacity is not refrigerated.

Needs of Family

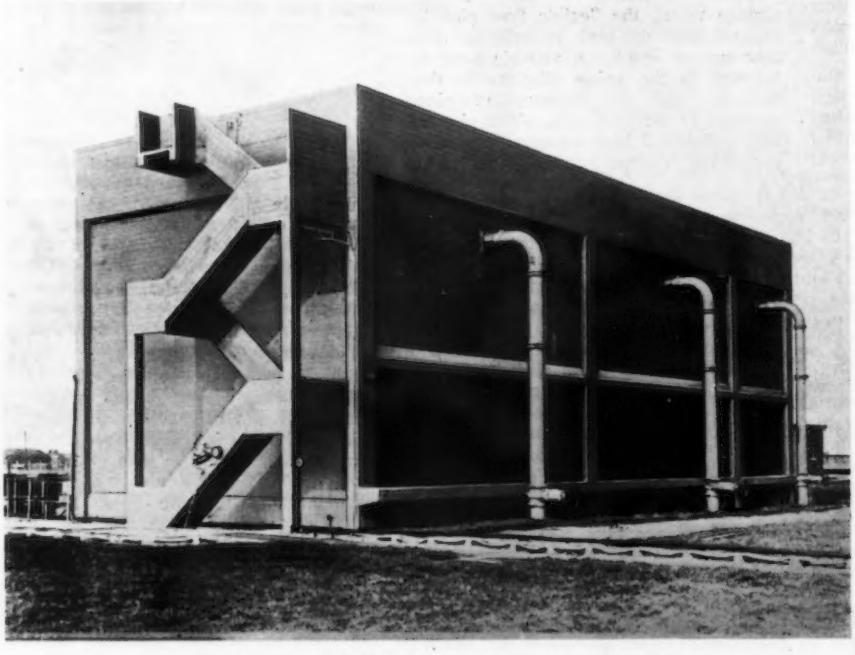
The evaporator is constructed to give a frozen-food storage compartment large enough for the needs of the average family. Masked by a white plastic cover with drop door, the evaporator will accommodate the two ice trays supplied, plus about 4 lb. of pre-packed frozen-foods or ice cream.

The cabinet is fitted with two full-width shelves and one half-width shelf, in fine chromium finish. The bottle shelf is reversible and will take either large or small bottles according to the position used. Two clear, plastic containers are provided. One, which is supported on runners below the frozen-food compartment, is for meat or fish; and the other is for salads. The two are interchangeable.

A thermostat is fitted at the top of the unit immediately under the ventilation grill for ease of maintenance. The control, situated in the top breaker strip, gives a constant temperature in the cabinet.

The unit and cabinet are designed to make ice in room temperatures of up to 95° F., particular attention having been paid to eliminating heat leakages by direct conductivity.

The cabinet and accessories—except the plastic dishes—are guaranteed for one year. National after-sales service will be undertaken by the Main-Morley service organisation which has depôts at Edmonton, Padiham, and Falkirk.—*R. & A. Main, Ltd., 48, Grosvenor Gardens, London, S.W.1.*

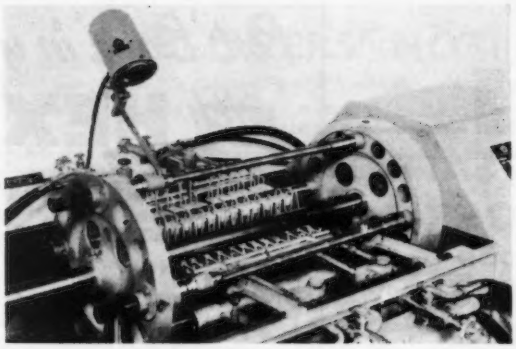


WATER COOLING BY MODERN METHODS

The Tower illustrated is of the induced draught type fitted with fans in the roof.

Specifically designed to give long range cooling or close approach between water temperature and wet bulb.

THE DAVENPORT ENGINEERING CO., LIMITED
BRADFORD



Seen in operation at the recent Gas at Work in Industry Exhibition, this Peddinghaus oxy-town gas flame-hardening machine type NWA is completely automatic in action. Specially designed to harden steel or cast iron camshafts, it may also be used for a large variety of components requiring specific areas to be hardened

Oxy-town Gas Harnessed for Controlled Flame Hardening

THE increasing popularity of flame-hardening is the outcome of the accurate control of the process developed by the German firm of Peddinghaus. Surface hardening had for years appealed to the production engineer, but until the introduction of the oxy-town gas flame, Milliscope automatic temperature control, and specially designed flow-meters for gas and oxygen, the human element had involved the risk of inconsistency.

With the adoption of these refinements, it is now possible to obtain consistent and controlled hardness zones with a minimum of skill and effort, as was explained on p. 182 of our January 23 issue in the review of the Gas at Work in Industry Exhibition. The depth of hardness may be varied and the degree of hardness is closely related to the carbon content of the material from which the components have been manufactured.

The use of town gas with oxygen has several distinct advantages over other fuel gases. For instance, 90% of town gas can be consumed at the orifice of the burner, whereas with oxy-acetylene it is only possible to burn 25% at this point, the remaining 75% being consumed in secondary air away from the burner orifice and, therefore, wasted.

Small Flame Volume

Because of this advantage the oxy-town gas flame is very small in volume and the loose flame characteristic of oxy-acetylene flame-hardening is entirely absent. The temperature of the oxy-town gas flame is also extremely well suited to heating the surface of material, because although it is some 800° to 1,000°C. lower than the oxy-acetylene flame, it is well above the hardening temperature required for steel components. This lower temperature also provides far greater latitude or tolerance in the process of surface hardening. The proportion of town gas to oxygen is 100 cu.ft. of gas to 60 cu.ft. of oxygen.

Satisfactory results by flame-hardening may be obtained with most carbon or alloy steels having from .3 to .7% of carbon and with cast irons having small graphite flakes and a comparatively low phosphorus content. For those who wish to employ case-hardening steel and carburise the component it may, of course, be flame-hardened, thus eliminating the distortion brought about by heating the whole of the component in a furnace to the hardening temperature.

A wide range of flame-hardening machines has been designed by Peddinghaus so that practically all types of components, both large and small, may be accurately and economically hardened. Sole concessionnaires for Peddinghaus plant in Britain.—*Surfard, Ltd., Abbey House, Victoria Street, London, S.W.1.*

HELPING SOLVE THE PROBLEM OF DEGREASING

IDEAL for degreasing small components such as bearings, ball races, nuts, bolts, oil and air filters, brake shoes, etc., the Jizer pressurised degreasing unit consists of a robustly constructed steel bucket, into which fits a strong galvanised wire mesh basket fitted with a tray on which the components to be degreased rest. Below the tray is an agitator unit, well made in brass.

This completely portable unit, for use with Jizer soluble solvent, employs compressed air from an ordinary air line to assist, speed up, and improve the degreasing process.

Jizer will take up many times its own volume of grease and oil and still remain completely soluble in water. It converts spent oil and grease into ordinary soap suds.

It is safer and less costly than vapour solvents or petrol, and outmodes strong alkalis and paraffin degreasants in common use, being more thorough and less crude.—*Deb Chemical Proprietaries, Ltd., Forfar Chemical Works, Belper, Derbyshire.*

NEW MULTI-CELL CYCLONE DUST COLLECTOR REDUCES COSTS

THE multi-cell cyclone mechanical dust collector presents a cheap and efficient solution to many of the problems involved in the elimination of atmospheric pollution arising from the stack emissions of all types of boilers. The Holmes-Rothemuhle Collector is the latest of this type to become available in this country. It is being manufactured and marketed under licence, in the United Kingdom and certain Dominions by the Gas Cleaning Division of W. C. Holmes & Co. Ltd.

High dust separation efficiency is derived from the relatively small diameter of the individual cyclones which comprise the complete unit. By using a number of such cyclones in parallel the pressure drop across the unit is kept to a minimum.

A unit cell consists of two concentric tubes—an outer flue-gas cylinder with an impeller fixed at the inlet, and an inner clean gas pipe. An intense swirl is imparted to the dust-laden gas as it enters the cell causing the dust particles to be centrifuged to the annular collecting space. The dust then gravitates to hoppers below, while the cleaned gas is drawn through the inner tube into the outlet ducting.

The complete collector comprises a honey-comb of unit cells welded together to form a compact, rigid structure. The impellers are about 4 in. in diameter and are cast from abrasion resisting alloy, while the tubes and plates are of mild steel.

Simplicity in design means that initial costs are low, and since no secondary cyclone collecting is necessary operating costs are also minimised. A striking feature of the cell assembly is its economy in space occupied, which enables it to be conveniently located in the flue-gas ducting.

The collector itself is always inclined since the back plate forms a chute for conveying the separated dust into the hoppers, but the gas inflow may be axial with the inclined cells, vertically downwards, or, horizontal. If conditions demand a vertically upward gas inlet, an alternative arrangement using a reverse-flow cell is used.

Multi-cell cyclones are sometimes regarded to be prone to blockages, but these are unknown in plants where a Holmes-Rothemuhle collector is installed. Even in the unlikely event of a complete choking of the dust collecting annulus, boiler operation will not be interrupted; only the dust separating process will be temporarily halted, and this will automatically restart on the removal of the bunker ash.

This collector is suitable for a variety of problems ranging from removal of fly ash from boiler flue gases, collection of unburnt combustible matter for re-circulation into boiler furnaces, to separation of dust in extraction systems in foundries and recovery of valuable fines from crushing, grinding and drying operations. —*W. C. Holmes & Co., Ltd., Turnbridge, Huddersfield.*

M & M PATENT METER LOCKS

use the STRONGEST, SAFEST METER LOCK

- DON'T buy locks you may have to scrap in a few years
- DON'T look only at the initial cost
- DON'T think only of the present time: look to the future
- DO remember that good quality is cheapest in the long run
- DO take our word for it that our workmanship is consistently good
- DO profit by others' experience and use M. & M. Locks to protect your meters

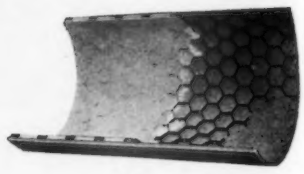
H. MITCHELL & CO.

36, 38, NEW CHARLES STREET, LONDON, E.C.1

Put 'Bone' in your linings with HEXMETAL.

HEXMETAL provides "Bone" structure to any form of plastic lining in

- HYDROFORMERS
- COKE HOPPERS
- CAT CRACKERS
- PIPE LININGS
- CHAMBERS
- FLUES, ETC.



Hexmetal may be supplied in mild, firebox type, or coated steel and in chromium alloys. When loaded with refractories or cements it is proof against the most severe conditions.

The patented pinned cells of Hexmetal provide strength to resist blistering and collapse of linings.

Complete fabrication of tailored and bound sections is undertaken to suit all shapes of pipes and vessels and the two-way flexible construction of Hexmetal is available for domed roofs.

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RETORT SETTINGS PRODUCERS, FURNACES REPAIRS.

GOODALL, CLAYTON & Co. LTD.
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CONVEYORS, ELEVATORS, BUNKERS, ROOFS, HOISTS, Etc.

PUBLISHERS' NOTICE

The " Gas Journal " is published every Wednesday, price 1/6d.; by post 1/8d.

Subscription Rates:—65/- per annum; (Payable in advance.) A copy of the " Gas Journal " Calendar & Directory is presented each year to continuous subscribers.

Classified Advertisements: All small classified advertisements are charged at 2/6 per line (approx. 7 words)—minimum charge 10/-. A Box Number address occupies 2 lines, and a further 6d. is charged towards cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's Journal.

Displayed Advertisements: Rates obtainable on application to the Business Manager. Change of copy for displayed spaces must be received 14 days prior to publication if proofs are required. Type area or inside pages 10 in. deep × 7 in. wide; block screen 120.

BUSINESS MANAGER: S. T. CULLEN

NORTHERN MANAGER: Philip W. B. King, Flat 1, 7 Langcliffe Avenue, Harrogate. *Telephone:* Harrogate 67625.

SOUTHERN & MIDLANDS REPRESENTATIVE: A. Engelhardt, T.D., 11, Bolt Court, Fleet Street, E.C.4. *Telephone:* Fleet Street 2236-7.

WALTER KING, LTD., 11, Bolt Court, Fleet Street, London, E.C.4.

Telephone: FLEet Street 2236-7. *Telegrams:* Gasking, Fleet, London.

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Telegrams: "Purification, Stock, London." Telephone: London Wall 7938/9 & 7930

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For pumping water or other liquids.
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"KLEENOFF" ★
THE COOKER CLEANER

"KLEENOFF"
FIBRE BRUSHES
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KETTLE DESCALER

For resale to the public and in bulk for works use

BALE & CHURCH, LTD.
CROMPTON WAY, CRAWLEY, SUSSEX

MISCELLANEOUS

FOR SALE.—SYPHON POTS, SURFACE BOXES and GAS WORKS CASTINGS. Specialists to Gas Boards throughout the British Isles. Berry's Foundry (1949), Ltd., Hammerton Street, Bradford, 3. 'Phone 22701.

PLANT FOR SALE

SPECIAL OFFER: Large quantity of new cast iron fullway valves, all iron parts, 8 in., 10 in., 12 in. and 14 in. for sale. The Midland Iron & Hardware Co. (Cradley Heath) Ltd., Cradley Heath, Staffs. Tel.: Cradley Heath 6264 and 5.

FOR SALE.—New Oil Pumps—all iron fitted. Evans Duplex. D. A. 8 in. steam 6½ in. pumps. 6 in. stroke. 40 tons per hour. Weir Vertical 8 in. by 9 in. by 18 in. 68 tons p.h. Weir Vertical 4½ in. by 5 in. by 12 in. 2,350 g.p.h. Cleckheaton Engineering Co. Ltd., Cleckheaton, Yorks. Phone 397.

APPOINTMENTS VACANT

TAR RESIDUALS LTD. require SALESMAN experienced coal tar products, technical qualifications an advantage. Apply to Plantation House, Mincing Lane, London, E.C.3.

COLONIAL GAS HOLDINGS LIMITED MELBOURNE, AUSTRALIA

APPLICATIONS are called for the following appointments:—

MANAGER

Manager of a Melbourne suburban gas undertaking with an annual output of approximately 1,200 million cubic feet of 500 B.T.U. gas manufactured in Glover West continuous vertical retorts.

Duties.—To be responsible under the direction of the General Manager, for the control of the Works and District of the undertaking.

Salary. — £2,000-£2,500 Australian currency, depending upon experience and qualifications.

A car will be provided for use on company's business.

WORKS SUPERINTENDENT FOR SAME UNDERTAKING

Duties.—Under the direction of the Manager, to be responsible for all gasworks' operations.

Salary. — £1,700-£1,800 Australian currency, depending upon experience and qualifications.

In each case, the company will pay one-class steamer fares (P. & O. or Orient Line) to Melbourne for appointee and his family, and also transport personal effects. Salary will commence from date of embarkation. If required, assistance will be given with securing of suitable housing in Melbourne.

Applications should be submitted by March 4, addressed to The Colonial Gas Association Ltd., care William Coward & Co. Ltd., 3, St James's Square, London, S.W.1.

SHIFT SUPERVISORS required for Coal Carbonisation and By-Product Recovery Plant near Chesterfield. Applicants should have experience of control of all types of labour and knowledge of steam raising and gas producer plants. Previous experience on similar Works an advantage. Concessionary fuel allowance is given. Write in first instance giving particulars of age, experience and salary expected, to No. 312, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

WALES GAS BOARD

SWANSEA UNDERTAKING
TECHNICAL ASSISTANT (DISTRIBUTION)

APPLICATIONS are invited from suitably qualified and/or experienced persons for the above-mentioned vacancy.

Applicants should be experienced in the preparation of specifications, drawings and estimates for distribution work; experience in the control of labour and in the supervision of work being carried out by Contractors would be an advantage; the district is a rapidly expanding one both in industrial and domestic consumers numbering 40,000 at the present time.

Salary will be in accordance with Grade APT 6 (Provincial 'A') of the National Salary Scales (£610/£690), commencing at a figure commensurate with qualifications and experience.

The post is pensionable. The successful applicant will be required to pass a medical examination.

Applications, stating age, training, experience and qualifications, accompanied by names of two persons to whom reference can be made, should reach the undersigned not later than Friday, February 22, 1957.

A. PICKARD, M.Inst.Gas E., M.I.I.A.,
General Manager and Engineer.

Gas Offices,
Oystermouth Road,
Swansea.

WALES GAS BOARD

SWANSEA UNDERTAKING
APPOINTMENT OF SENIOR TECHNICAL ASSISTANT (DISTRIBUTION)

APPLICATIONS are invited from suitably qualified persons for the above appointment for which the salary will be within the range of Grade APT 7/8 'A'—£670/£790 per annum commencing at a figure commensurate with qualifications and experience.

A house with garage will be available at a reasonable rental, if required.

The district is a rapidly expanding one both in industrial and domestic consumers numbering 40,000 at the present time.

Applicants should be experienced in Modern High/Low Pressure Gas Distribution Practice, including mainlaying and planning and in control of Distribution personnel.

The position is pensionable. The successful applicant will be required to pass a medical examination.

Applications, stating age, experience, professional qualifications and particulars of training, together with the names of two referees, should be received by the undersigned not later than Friday, February 22, 1957.

A. PICKARD, M.Inst.Gas E., M.I.I.A.,
General Manager and Engineer.

Gas Offices,
Oystermouth Road,
Swansea.

(*Classified advertisements continued on page* 368)

APPOINTMENTS VACANT (ctd.)

A LEADING manufacturer of Domestic Gas Appliances requires the services of an experienced DEMONSTRATOR, age about 25 years. The successful applicant will be expected to assist the Chief Home Service Adviser in Cookery Demonstrations, Research, and liaison with Gas Board Home Service personnel.

Apply, giving age, full particulars of experience, and qualifications, to No. 313, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

WEST MIDLANDS GAS BOARD

BIRMINGHAM AND DISTRICT DIVISION
WORKS SUPERINTENDENT—SOLIHULL

CANDIDATES should possess retort house experience and have a sound working knowledge of wet and dry purification, exhausting, boosting, gas storage, and general works routine. Experience in controlling labour is essential and the possession of a technical qualification such as a Certificate in the Technology of Gas Manufacture, or its equivalent, will be an advantage.

The Works produces base load coal gas from C.V.R.'s and will shortly have a capacity of 3½ mill. cu.ft. per day. The person appointed will be responsible to the Engineer and Works Manager, or his Deputy, and must be able to take charge of the works in their absence.

The salary will be within A.P.T. Grade 8 of the National Salary Scales for Gas Staffs (£710-£790 per annum).

The post is pensionable and the successful candidate may be required to pass a medical examination.

A pleasant house, in which the successful candidate must reside, is available on the Works at a reasonable rent.

Applications, stating age, qualifications and experience, together with the names of two referees, should be addressed to Mr. J. E. Wakeford, Divisional General Manager, West Midlands Gas Board, Gas Offices, Edmund Street, Birmingham, 3, to reach him by not later than February 25, 1957.

J. C. INGRAM,
Secretary to the Board.

NORTHERN GAS BOARD

DARLINGTON DIVISION

APPLICATIONS are invited for the following appointments:—

DIVISIONAL CHIEF ENGINEERING ASSISTANT

The minimum grading for this post is Provincial 'A' Grade A.P.T. 10 (£820-£920), but the Board reserve the right to place the occupant, either at the time of appointment or later, in Grade A.P.T. 11 (£850-£975) should his qualifications, experience or performance of the duties of the post merit such higher grading.

Corporate Membership of the Institution of Gas Engineers or an equivalent qualification in Engineering is essential.

Duties include the preparation of plans, specifications, maintenance and control of Engineering & Constructional projects within the Division.

TECHNICAL ASSISTANT (MECHANICAL)

The minimum grading for this post is Provincial 'A' Grade A.P.T. 7 (£670-£750), but the Board reserve the right to place the occupant, either at the time of appointment, or later, in Grade A.P.T. 8 (£710-£790) should his qualifications, experience or performance of the duties of the post merit such higher grading.

Duties include the maintenance of plant, machinery and buildings at the Darlington Unit, and candidates should possess the Higher National Certificate in Mechanical Engineering or equivalent qualification.

TECHNICAL ASSISTANT (PRODUCTION)

The minimum grading for this post is Provincial 'A' Grade A.P.T. 5 (£575-£655), but the Board reserve the right to place the occupant, either at the time of appointment, or later, in Grade A.P.T. 6 (£610-£690) or Grade A.P.T. 7 (£670-£750) should his qualifications, experience or performance of the duties of the post merit such higher grading.

Candidates should be conversant with the operation of Continuous Vertical Retorts, Carburetted Water Gas Plant and Ancillary Plant.

Applicants should have completed their National Service. The posts are pensionable and successful candidates will be required to pass medical examinations.

Applications, stating age, qualifications and experience, together with the names of two referees should be received by the undersigned not later than February 25, 1957.

F. WILSON.
Divisional General Manager.

Gas Offices,
John Street,
Darlington

NORTH THAMES GAS BOARD

SENIOR DRAUGHTSMEN are required in the Chief Engineer's Department at Westminster, S.W.1, for:—

(1) The design and layout of general process plant and all associated structural steelwork.

(2) The design and detailing of civil engineering foundations and structural work mainly in reinforced concrete associated with gas manufacturing plant.

Candidates should preferably be Corporate Members of the Institutions of Civil, Structural or Mechanical Engineers.

Starting salaries within the range £850-£1,000 per annum according to age, qualifications and experience.

The successful candidates will be required to join the Staff Pension Scheme.

Applications, giving age and full particulars, should be sent to the Staff Controller, North Thames Gas Board, 30, Kensington Church Street, W.8, quoting reference 666/314.

SCOTTISH GAS BOARD

FIFE GROUP
GROUP DISTRIBUTION SUPERINTENDENT

APPLICATIONS are invited for the position of GROUP DISTRIBUTION SUPERINTENDENT.

The position carries a salary up to Scale Grade 9, Provincial 'A,' i.e., £755/£855 per annum with placing according to experience.

Applicants should state in their application technical qualifications, giving details of previous experience, with particular reference to the use of Towns Gas for Industrial purposes, High and Low Pressure distribution, and outlining experience in preparing and designing integration schemes.

Applications to be sent in to reach the undersigned not later than February 22, 1957, with *copies* of Testimonials or the names and addresses of two referees to whom reference can be made.

The position is superannuated and a medical examination will be required.

A three-apartment house at a moderate rent is available with immediate entry.

(Sgd.) DAVID L. DICKSON,
Group Manager.

Gas Offices,
Grange Road,
Dunfermline.

SOUTH WESTERN GAS BOARD

BRISTOL/BATH DIVISION
APPOINTMENT OF TECHNICAL ASSISTANT

APPLICATIONS are invited for the position of TECHNICAL ASSISTANT. The appointment will be graded A.P.T. 5, 6 or 7 (£575-£750) per annum, precise grade to be applied being dependent upon experience and qualifications.

The duties include Works supervision of all types, including Horizontal Retorts and Water Gas Plant.

Applications to be received by the undersigned not later than Saturday, March 2, 1957.

CHARLES R. INGHAM,
Production Engineer and Manager.

Radiant House,
Bristol, 1.

February 7, 1957

SOUTH WESTERN GAS BOARD

SENIOR TECHNICAL ASSISTANT ON AREA SCIENTIFIC STAFF

APPLICATIONS are invited from qualified TECHNICAL ASSISTANTS and GAS WORKS CHEMISTS for the above vacancy.

The person appointed will be based at the Area Scientific Headquarters, Bristol, under the control of the Area Scientist, and will be required to visit Works in the Area for varying periods of time. The duties will consist primarily of working in co-operation with the Technical Staff at the Works being visited in connection with Retort House control, Fuel Efficiency, Purification, and other technical investigations which may be required. The possession of the Higher Grade Certificate of the Institution of Gas Engineering (Manufacture) or an equivalent Chemical qualification is necessary.

The salary for the post will be within Grade A.P.T. 10 of the Salary Scales of the National Joint Council for Gas Staffs (£820-£920 per annum) according to the experience and qualifications of the successful applicant.

The successful applicant will be required to pass a medical examination and to join the Board's Pension Scheme.

Applications, stating age, qualifications, and giving particulars of training and experience, together with the names and addresses of two referees, should be sent to the Area Scientist, South Western Gas Board, Area Scientific Headquarters, Cannon Marsh Gasworks, Bristol, 1, not later than March 16, 1957.

February 6, 1957.

SOUTH WESTERN GAS BOARD

APPOINTMENT OF SENIOR HOME SERVICE ADVISER, WESTON-SUPER-MARE.

APPLICATIONS are invited for the above position from suitably qualified persons holding a recognised Domestic Science diploma or certificate.

Candidates must be capable of conducting lectures, demonstrations and practical classes, also of advising consumers in their own homes in the use and care of gas equipment. Salarly £492-£640 p.a. (196-).

Details and application forms which are obtainable from J. D. Butler, 30/32, The Boulevard, Weston-super-Mare, to be returned by March 1, 1957.

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EAST MIDLANDS GAS BOARD

ORGANISATION AND METHODS OFFICER

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The person appointed will be responsible to the Secretary of the Board for the study of organisational problems and clerical methods and procedures throughout the Area of the Board and should be familiar with modern developments in business systems and machines. An accounting background would be an advantage.

The post is pensionable, and the successful applicant will be required to pass a medical examination. Applications stating age, education, qualifications and experience, together with the names and addresses of two referees, should be addressed to the Secretary, East Midlands Gas Board, Beverley House, University Road, Leicester, not later than February 25, 1957.

NATIONAL COAL BOARD

TECHNICAL ASSISTANT

APPLICATIONS are invited for the position of TECHNICAL ASSISTANT at Altham Coke Works, Accrington, Lancashire. The duties will cover routine plant control and process investigation to improve technical efficiency. Applicants should preferably hold a Higher National Certificate or a First Class Certificate of the City and Guilds in Coke and By-Product manufacture. Salary within the range for Carbonisation Technical Officers Grade 3 (£575-£1,025) per annum. Applications should be sent to the Area Staff Manager, National Coal Board, No. 4 (Burnley) Area, 72, Bank Parade, Burnley, giving age and full particulars of education, qualifications, experience and present salary within 10 days of the appearance of this advertisement.

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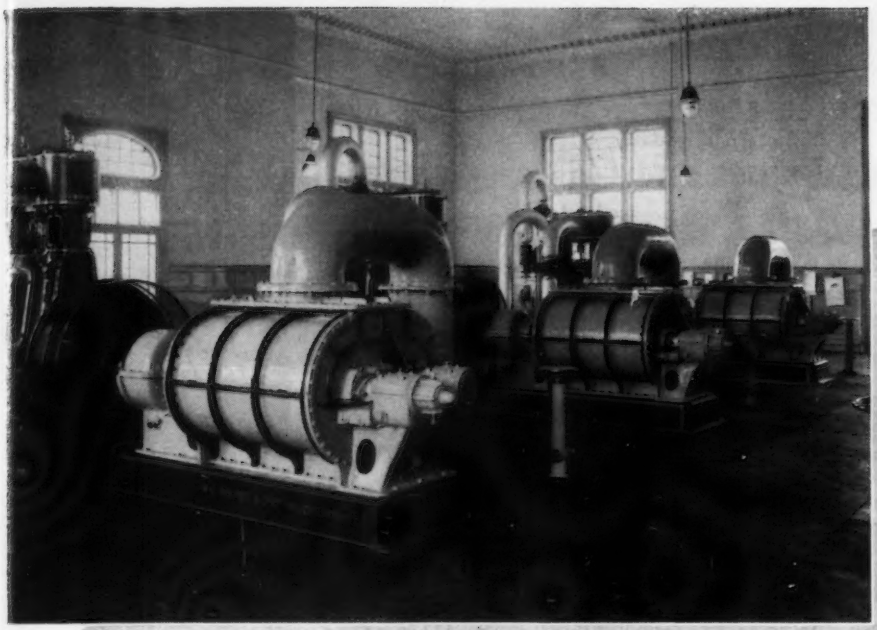

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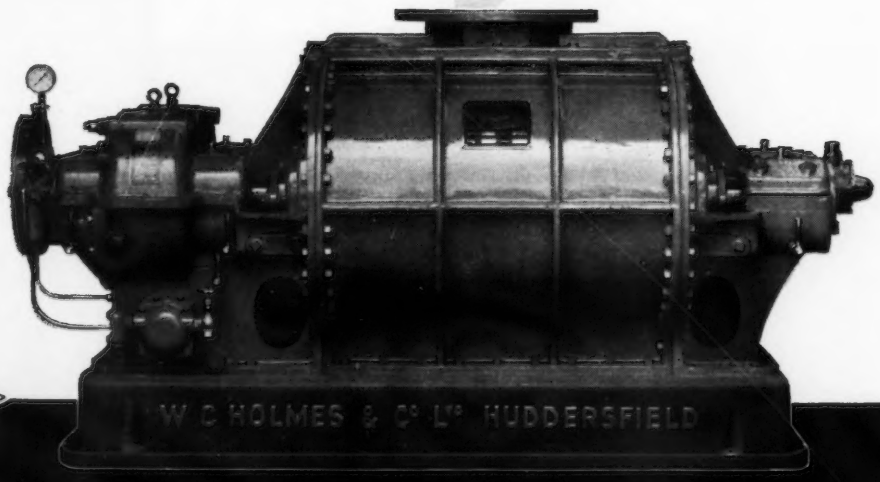

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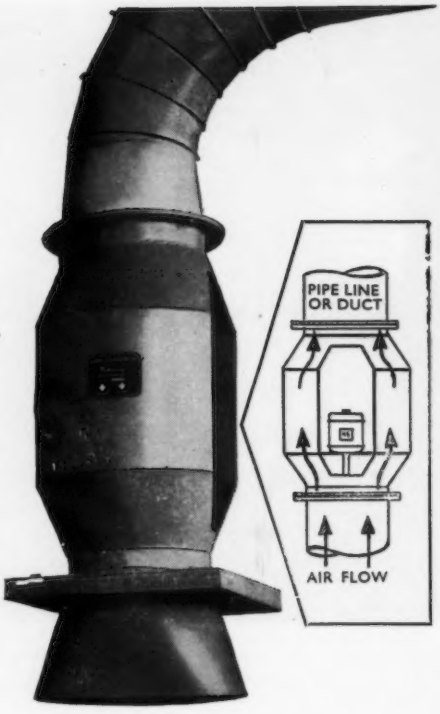

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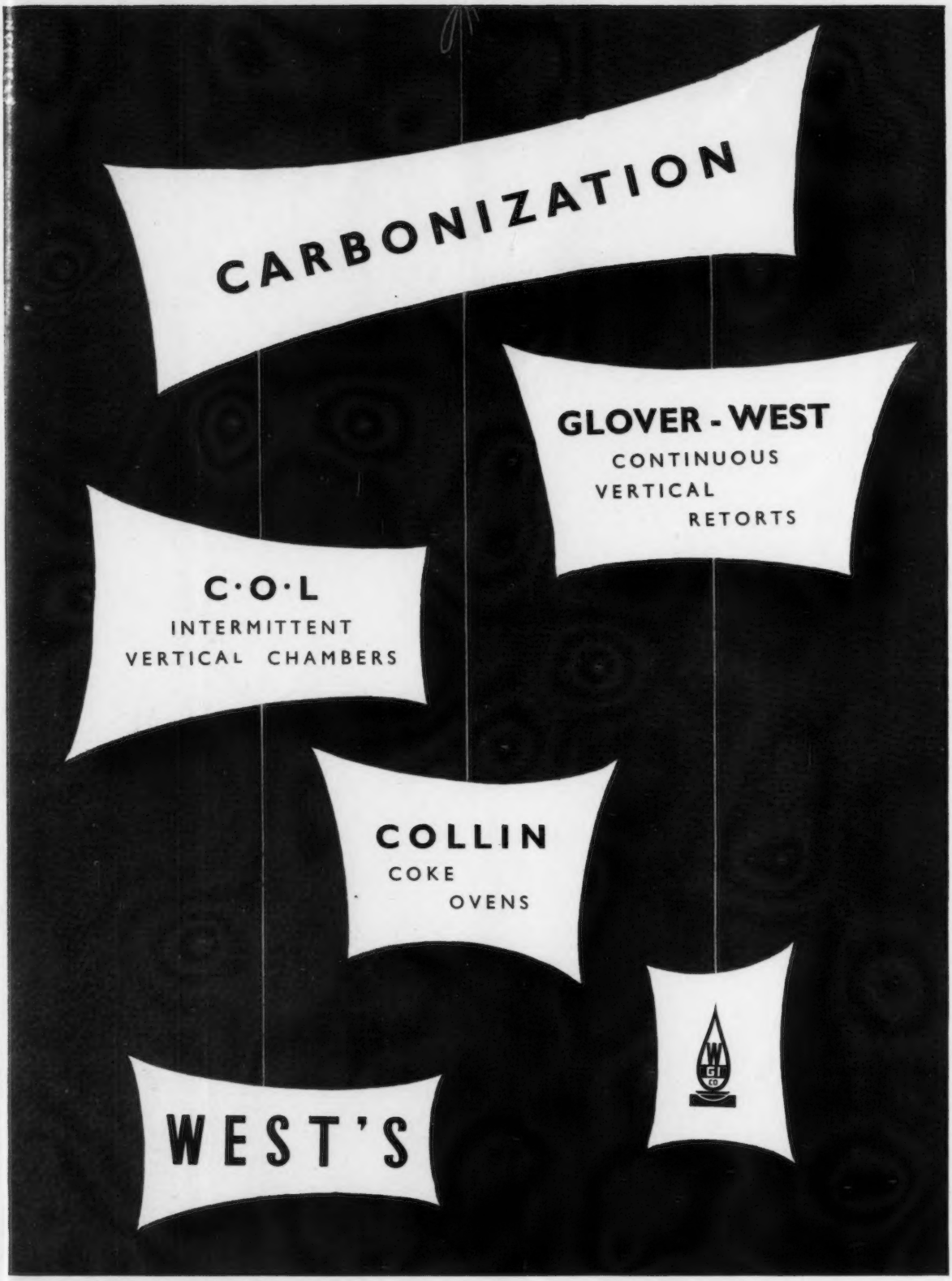

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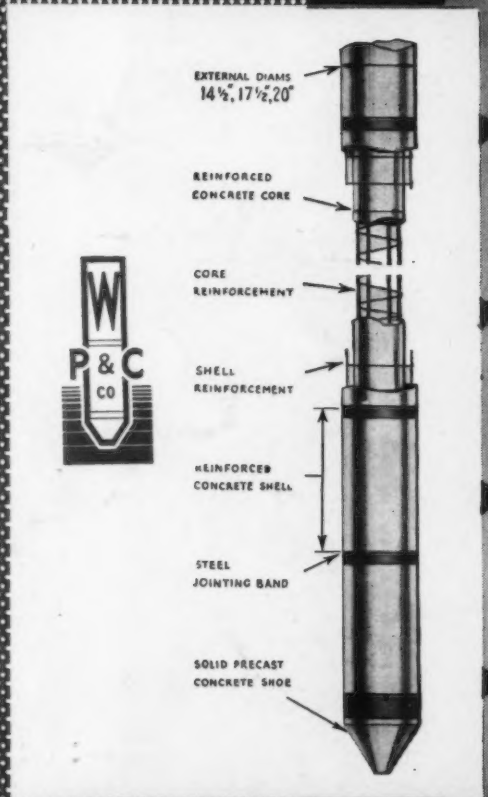

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